Impact of niche strategies on the business model dynamics.

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A case of study of AWES startups

by

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In partial Fulfillment of the requirements for the Degree of

Master of Science
in Sustainable Energy Technology

at the Delft University of Technology, Faculty of electrical engineering, Mathematics and Computer Science.

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Project duration: March, 2023 – September, 2023

TU Delft

Preface

We create new and amazing technology as engineers, however, this technology fails to see the light of day. So the question I asked myself was as to how I can commercialise a technology. This leads me down the path of achieving large-scale diffusion. A whole new topic, studying it, however, has been an absolute pleasure as I believe we now know more regarding how to take these technologies into the market and commercialise them.

This work is a compilation of several months of research and refinement. There have been numerous issues along the way regarding how to go about writing a thesis and it indeed was a challenge. I would like to thank my parents for their belief and support in me. I could not have done this without their support. I would also like to thank my friends for their support without which this task would have become exponentially tougher. I would like to give a special mention to a few people who have been vital towards the completion of this thesis. This thesis would not have been possible without the support of my brother Rajiv, my friends Atharva, Divyanshu, Kajal and Tristan, and my Delft family with the adorable name of ”Pitstop Peeps”. I would also like to thank and give a special mention to Nivedita and Jabin for their English advice! I would also like to thank myself without whom this would not have been possible.

I would like to extend a special thanks to my supervisor Dr. H. Khodaei for her belief in me and for pushing me to do the best I can. I have always had great meetings with her that have left me full of ideas, and at the same time helped me overcome many challenges I had faced during the thesis itself. She has a contagious energy that leaves me feeling positive and motivated to work. I am glad to have had the opportunity to work with Dr. H. Khodaei.

I would like to also thank Dr. L. M. Kamp, for her feedback and her kind motivating words. While her feedback was critical, she was still very positive about the work and my capabilities. My discussions with her have been informational and motivating. I am thankful to have such amazing supervisors and without them, this thesis would not have been possible.

Sanjeev Poduri - 5493676
Delft, November 2022

Executive Summary

Technological innovations to be carefully managed to be able to lead to technology diffusion or commercialization. The technology is in the possession of a startup or a company, and pence, the development of the startup or company can be associated with technology diffusion. The research highlights historical cases of technology that aim for diffusion; some cases are successful, and many have been identified that have not achieved diffusion, due to poor management of either the technology or the company/startups. Therefore two key associations have been made so far:

1. The technology needs to be properly managed to ensure it can achieve large-scale diffusion. This can be done by the implementation of niche strategies, specifically ones that aid in the large-scale diffusion of radically new technology.

2. The new technology is managed by an organization due to which the growth of the organization may be co-related to the diffusion level of the technology in a rudimentary sense.

Hence, it is now imperative to identify if there is a relationship between business models and niche strategies given that both of them play a significant role in the growth of a company.

The objectives of the research are, therefore, identified. The research aims to determine the impact of niche strategies on the business model dynamics of a company/startup based on radically new technology. The strategies under investigation have been identified and laid out by Dr. Roland Ortt. Niche strategies are used to break down or circumvent certain barriers to large-scale diffusion. Therefore, these barriers to large-scale diffusion need to be identified first. The identification of these barriers is done by employing an already-existing framework known as the ”Technology Innovation System (TIS). Literature highlights theoretically as well as from past examples that business models are directly associated with the growth of a company. Given that, this research focuses primarily on growth strategies, business models become a vital component that needs to be investigated as there is a relation to be explored between niche strategies and business models. The study aims to build a new framework that could be used to trace the business model dynamics of a company as a function of niche strategies. To build this new framework, inspiration was drawn from the TIS research for the methodology.
The first research question requires a literature review of the topics to try and establish a theoretical relation. The second research question focuses on identifying and using historical cases to trace the relationship between niche strategies and the business model of a company. The third research question acts as an initial test or attempt at validating the model that was built by answering the first two sub-research questions. The model and findings of the research are applied to Airborne Wind Energy System-based companies, Kitepower and Kitenergy. The methodology can be broken down into three steps.

First, establish a theoretical relation between niche strategies and business models. In this research, no literature supports this research. Hence, theoretical definitions are studied for both niche strategies and business models. Further, historical cases of technologies that used niche strategies are identified.

Second, a thorough investigation into the historical cases is conducted, and the TIS framework is applied to each historical case to identify the barriers to large-scale diffusion. The company/startup would have taken action to overcome these barriers, and the actions are studied, and the changes are visible in the business model. By correlating these changes, a pattern of impact may be identified as a result of implementing niche strategies. This pattern is the proposed pattern identified by the author of this research. Based on the identified relations, a new conceptual framework was set up. It seems like a rudimentary mix of the TIS factors and business model dynamics. However, the snapshot of the canvas provides a lot of information in one glance. It shows us the current versions of the business model employed; it shows how the model reached the current version. It is also able to show us what

barriers existed then, which led the company to make a particular choice. The framework is applied to historical cases to visualize the changes.

Third, the framework is applied to two AWES-based startups in an attempt to validate the framework. Kitepower is one of the subjects of this study. The study on Kitepower is more detailed due to easier access to the company. The framework, when applied to Kitepower, could potentially highlight the temporal effects of niche strategies that may have not been visible in historical cases. It was found that, on applying the framework to the test cases, a deviation is observed from the proposed pattern for both startups. The reason for the deviation could be attributed to many factors. The first is that the changes MAY not have occurred yet as part of the niche strategy. The second is that both companies are still in the very early phase of the product diffusion curve.

The case of Kitepower is unique given that it is a longitudinal case. Kitepower has been studied for some time. The framework is based on historical cases and has been applied to them. An interesting observation is made from this application. A niche strategy is applied to overcome or circumvent certain identified barriers. The point of interest is that the barriers overcome, are the targeted barriers, and in some cases, other barriers and influencing factors are also overcome. Hence, a second pattern is identified from the historical cases; this explores the relationship between niche strategies, barriers, and influencing factors. A new pattern is identified. Hence, from this study, two patterns have been identified. The first pattern proposes a relationship between niche strategies and their impact on the business models. The second pattern proposes a relationship between niche strategies and the factors in TIS. The framework builds on the existing TIS framework and the business model dynamics framework. The two frameworks have been built with different purposes and different perspectives. Combining the two to create a framework that could theoretically incorporate both perspectives into one model could have a positive implication. The tool could work well in startups or younger companies, which have to be quicker to respond to market conditions due to their lack of resources. This tool forces the companies to look at actions that have been ineffective and dedicate resources to a more effective solution. Moreover, it serves as a historical record to see the niche strategies that have been used so far and how it has been done. This would allow companies/firms to create personalized strategies that work best for them.

The research aims to create a tool that is more holistic in terms of the factors considered while adopting the functioning of the business. Business model innovations typically involve optimizing the existing structure of the business to make it more profitable. Niche strategies involve identifying the existing barriers to large-scale diffusion or growth. Both changes are necessary. However, by combining these perspectives, a fully informed decision can be made that can maximize growth while minimizing changes to be made.

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1 Introduction

This Chapter consists of some background information relevant to the topic, upon which the research questions will be identified. The research gap is then identified and an attempt is made to resolve it. The scope of research was determined and its applications were identified. Finally, the methodology is laid down to which the thesis will adhere to.

1.1. Background

The background contains brief definitions required for the research. The background mentions briefly business models, business model dynamics, and niche strategies.

1.1.1. Business Model

The term business model first saw use in an academic article in the year 1957 based on (DaSilva & Trkman, 2014). While the term was mentioned only once, it was highlighted that there is a connection between business models and reality. It was in 1960 that the term 'business model' found usage as the title of an article, however, there is no mention of business models which highlights the lack of a proper definition for the term as highlighted out in (DaSilva & Trkman, 2014). The term business model saw an increase in use after the introduction of the business model canvas by (Osterwalder et al., 2005). The paper also provides a definition for a business model which is quite broad. A better definition is therefore chosen from (Casadesus-Masanell & Ricart, 2010) which cites (Amit & Zott, 2001) with the following definition:

A business model depicts the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities.

The definition while being vague manages to capture the essence of business models. Business models keep track of all the actions taken by the company that enable it to create revenue. It is interesting to note the concept of business models was more prominent in E-commerce rather than management literature. It was around 2000-2001 that, this concept started gaining traction in management literature (Nielsen & Lund, 2014) (Shafer et al., 2005). As research progressed, visual tools were developed to help visualize the business model of a company. Currently, the business model canvas is widely used and was developed by (Osterwalder et al., 2011) as explained in (Qastharin, 2016). There are 9 building blocks in the business model canvas, they are:-

1. Customer Segments: The various groups of consumers that the company aims to sell their product/service to. An example of this would be a car company with many different products. Each of their product is aimed at a different customer segment.

2. Value proposition: Specifies the products/services offered by the company that create or provide value to the customer. The value proposition may be qualitative (e.g.: price, quality of service) or qualitative (e.g.: Product features, consumer experience)

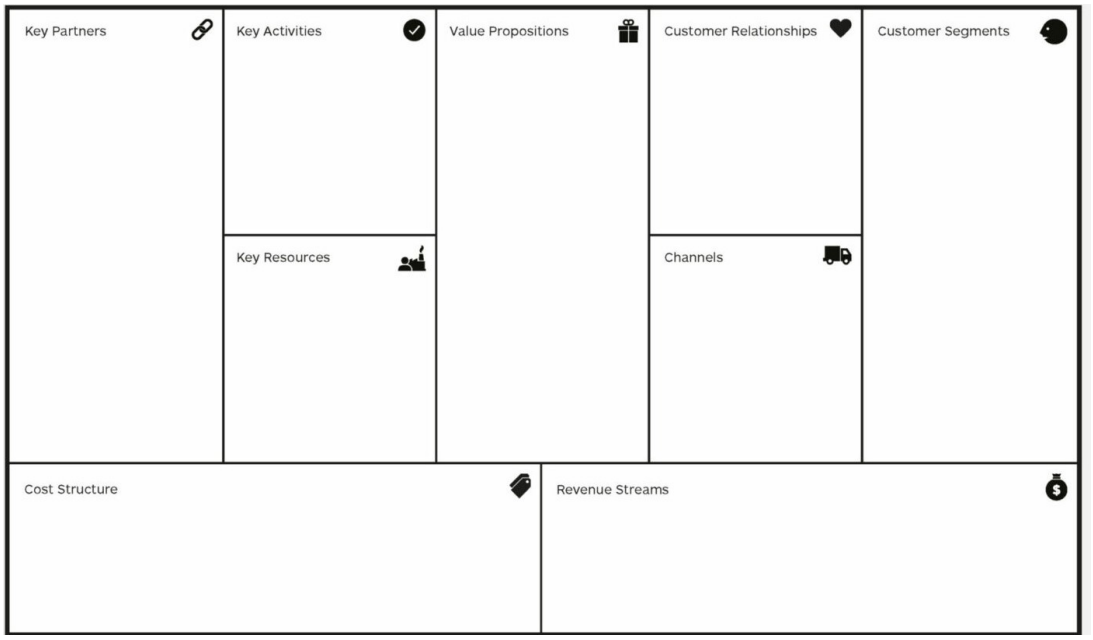

Figure 1.1: The business model canvas (Osterwalder et al., 2011)

3. Channels: Refers to the method or ways through which the company reaches the consumers. This encompasses the company's distribution and sales networks.

4. Customer Relationships: Refers to the types of relationships the company establishes with each of the customer segments. The relationship between the customer and company may or may not continue once the product is sold, the nature of which is dependent on the product. Companies or startups that provide specialized equipment also provide after-sales services. These post-sales services also serve as a relationship with the customers.

5. Revenue Streams: The methods through which the company is able to generate revenue.

6. Key resources: The resources employed by the company that allows it to create and offer value to consumers. These resources may be of any nature i.e. physical, financial, human, or intellectual. These resources may be owned or leased by the company.

7. Key Activities: The activities undertaken by a company to ensure that the business model would work. These are actions taken to create and offer value to the consumers, maintain customer relationships, and generate revenue.

8. Key partnerships: Refers to the network of the company. These partnerships include the network of suppliers and distributors. Any other partners that make the functioning of the business possible are also considered as key partnerships.

9. Cost structure: Refers to the costs incurred by the company while ensuring its operation. The cost structure includes manufacturing costs, overhead expenses, and any other costs incurred by the company.

It can therefore be said that the business model is vital in reducing the risk of failure as it understands the functioning of the company. For example, understanding how to effectively deliver value will have an impact on the revenue model followed by the company. If the process of value delivery to a particular customer segment is expensive, it would imply that in this particular case, the existing value capture method may be incorrect for the chosen customer segment. By knowing each of the 9 elements, the influences of one on the other are better accounted for. The business model canvas that is most commonly used and the one that will be considered in this study is depicted in Figure 1.1

A well-defined business model is vital for the success of a company, its role in the success cannot be highlighted enough. A few key reasons to highlight the importance of business models are listed below.

1. Value Creation:
   The business model enables the creation of value and it is the business model that is able to unlock more value from the product or service(Chesbrough, 2010). In the case of Xerox, research highlights that the company had the technology but had no idea what to do with it. Chesbrough argues that a company gains the same value by creating a new business model as it would from developing an innovative technology. Hence, the model can aid the company in how it provides value to its customers.

2. Revenue Generation:
   A company is able to profit from its product innovation only if its business model is well-designed and suitable for its specific case. A good business model is more efficient and more likely to yield profits (Teece, 2010) in comparison to one that is poorly optimized for the company.

3. Key stakeholders confidence:
   A business model is a reflection of the choices made by the company, it requires executives to understand the logic of the strategic decisions. The lack of a clear and effective business model highlights the lack of understanding from the senior management of the company. This acts as a deterrent for investors or stakeholders (Shafer et al., 2005).

4. Robustness:
   A well-designed business model allows the business to adapt and react to market conditions. It can help in new opportunities and market identification (Amit & Zott, 2001).

5. Resource allocation:
   A company has a finite amount of resources and a business model does a good job of keeping them in check. Through the business model, the company can allocate its resources more effectively and contribute to creating the most value from what is possible (Magretta, 2002).

6. **Strategic Choice**:
   Business models and strategies are quite a debated topic. Magretta, 2002 believes that strategy and business model are not the same. Some authors believe strategy and business models are the same and others believe they are different but related. There is some ambiguity in this regard.

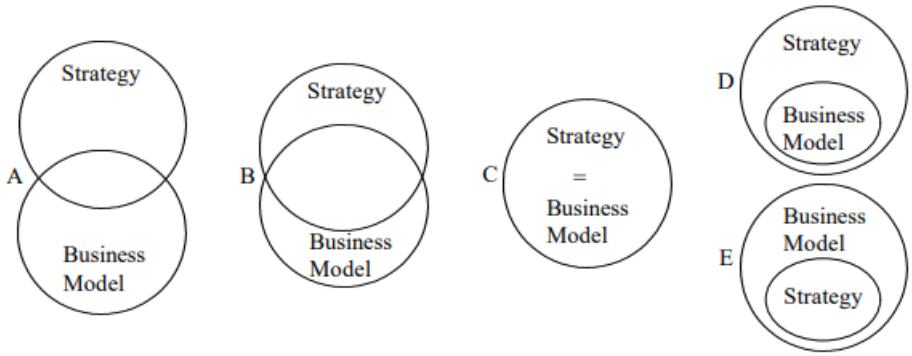

Figure 1.2: Possible overlap between business model and strategy(Seddon & Lewis, 2003).

It is argued that strategy involves defining a long-term plan for the company that ensures its appropriate positioning in the market (Seddon & Lewis, 2003). Business model definitions always seem to encompass all the activities taken by the company to create value and revenue (Seddon & Lewis, 2003),(Amit & Zott, 2001). Their definitions while a little abstract, do highlight that there is a connection between the two. The possibilities have been visualized in Figure 1.2. From the

above two arguments, they can be assumed to be independent of each other. It is interesting to note that in the definitions of business models, there was no mention of competitors or strategy. Osterwalder et al., 2011 defines business models a little differently, in this definition, the business model is an encapsulation of the activities taken by the company but also helps in achieving the strategic goals of a company. The definition used in this research is that strategy and business models are intrinsically related even though they are considered to be separate concepts (Casadesus-Masanell & Ricart, 2010). It can be concluded that business models are vital for the strategic choices of the company. As from the above literature, it is observed that there is debate on their definitions but there is a relation between these two components.

1.1.2. Business Model dynamics

A business model now exists, and a company functions based on this. One of the key abilities of the business model highlighted in the previous subsection was the adaptability aspect of it. Business models undergo changes depending on market conditions (external factors) and internal choices. This can be understood from the definitions (Amit & Zott, 2001). The definition involves identifying new opportunities and markets. Once this identification has been done, changes have to be made to the business model to address these new opportunities. Primary changes are made to the business model based on strategy and market conditions. The business model should undergo secondary changes to ensure that the changes made are internally consistent and mutually supportive of one another (Shafer et al., 2005). Business models have to undergo changes in order to ensure profitability or even ensure survival of the company. The case of Arsenal FC is highlighted in (Demil & Lecocq, 2010), which shows the importance of the same. In the case of Arsenal, the business model changes are the reason the club began performing well. Business model dynamics may lead to business model innovation as the cumulative changes to the business model contribute to creating a novel business model unique to that company or startup. Historic cases show examples of companies that have a fundamentally different model in an existing market that could do very well, given that the business model has been built correctly. (Casadesus-Masanell & Ricart, 2010) highlights the impact of the Ryan Air business model, and (Demil & Lecocq, 2010) highlights the importance of business model innovation through the case of Arsenal FC. Both these cases had a unique business model which worked well for each of them. Business model innovation is closely linked to business model dynamics. While both concepts are related to the dynamic nature of business, the fundamental difference lies in their focus. Business model dynamics tracks the evolution of the business model, whereas business model innovation entails changes to the business model driven by identified opportunities to better exploit the market (Saebi et al., 2017). The nature of changes may vary in each case; however, it is imperative to understand and track these changes over time.

The business model dynamics can be evaluated on different criteria. These criteria are completeness, interrelationships, interrelationships over time and framework changes (Khodaei & Ortt, 2019).

1. Completeness:
   Business model completeness involves both internal and external aspects that affect both the company and the environment (Khodaei & Ortt, 2019).

2. Interrelationships:
   Interrelationships exist between the various components of the business model. Information about these relationships helps the decision makers to make more informed decisions while understanding the true consequences of their actions enabling them to make better or more effective business models.

3. Interrelationships over time:
   The interrelationships may also be formed over time as a consequence of business model adaptations. Understanding the causes and effects of these relationships over time is vital to understanding the dynamics.

4. Framework changes:
   Business model innovation is linked with framework changes. These changes lead to radically new business models for the company to explore. Together with interrelationships over time, these two factors represent the evolution over time.

1.1.3. Niches

A simple search of the word niche results in a definition but further analysis shows that there are 2 types of niches, the first in biology and the second in markets. There can be a similarity drawn between these two cases as seen in Dalgic and Leeuw, 1994. Niches in biology refer to a habitat that has a specific set of characteristics that is beneficial for a specific organism. In management literature, a niche is a small market whose needs are not satisfied and are characterized by similar needs or preferences, they are considered to be a subset of a market segment(J. R. Ortt et al., 2013). The lack of competition in the niche segment enables the company to earn higher revenues from the chosen niches (Dalgic & Leeuw, 1994),(Abrar et al., 2009). According to Moroni et al., 2015 start-ups aim to enter the market via niches due to their smaller size and higher profitability.
Identifying a niche market involves choosing a specific segment with specific needs, preferences, and characteristics as defined above. Therefore identifying the right niche is important. It can be done by the following methods:

1. Market Research:
   Identifying a niche requires market research to be conducted to identify the portion of the market whose needs are not met.

2. Identify specific pains and gains:
   Identifying the specific gains provided by the company can be used as a reference point to identify consumers in the market with very specific pains. If the company is able to relieve the pain of these customers then, this is the market for the company.

3. Market emerging trends
   Being up to date with the market trends is of vital importance as a shift in a market trend might give rise to a new market for the company to explore. For example, if a brand makes a face cream, recent trends have shown that a chemical used in a competitor's face mask is produced by unethical methods. This would give rise to a new potential market of consumers willing to buy ethically sourced products. The example chosen to explain this was based on ethics to highlight the importance of public opinion. The emerging market trends may also largely be affected by public opinion (Spears, 2021).

Characteristics of a niche vary depending on the niche itself. (Akbar et al., 2017) however cites that based on Shani et al,1992, the characteristics of a niche are identified, they are :

1. The size of the niche is sufficient and there exists enough purchasing power in the niche for the product to be profitable.

2. The niche has the potential to grow.

3. The niche does not have competitors or is not lucrative enough for competitors.

4. The company should have sufficient skills and resources to exploit the niche.

5. The niche has barriers to entry for competitor firms.

1.1.4. TIS Framework and Niche strategies

TIS stands for technological innovation framework and it focuses on understanding the dynamics of an innovation system with a specific technology taken as reference. The TIS framework in reality is used as a method to determine the shortcomings of a specific technology. These shortcomings may be technical, environmental, or regulatory (Markard et al., 2015). This framework could then be theoretically extended to understand barriers to large-scale diffusion. However, in order to make a choice of niche strategy, more information is required as highlighted in (R. Ortt & Kamp, 2022). There are 7 basic building blocks of the framework.

1. Product performance and quality
   Determines if the quality and performance of the product are up to standards set by competitors, rivals, or regulatory authorities.

2. Product Price
   Determines if the product price is competitive in the market. If a product is too expensive, it will fail to attract any consumers. Moreover for new technology, the product price is high given their radically new nature. In the case of Kitepower, while their product is supposed to be cheaper than windmills, it currently has not reached that level of development yet and fails to remain price competitive.

3. Production system
   Assess if there is a production system in place that can consistently deliver high-quality products in large quantities(R. Ortt & Kamp, 2022).

4. Complementary products and services
   Refers to the availability of products and services associated with the product. If the market does not have any complementary products or if they are too expensive, then it may act as a barrier to large-scale diffusion.

5. Network formation and co-ordination
   Refers to the network of suppliers, distributors, and any other key actor that is important for the functioning of the company.

6. Customers
   Refers to the availability of consumers who are willing and can purchase the product. This targets the niche the company is targeting.

7. Institutions
   Refers to the formal and informal rules and regulations the product has to conform to. These rules and regulations also include government policies, safety standards, and laws.

As mentioned, these 7 blocks are not enough to choose a niche strategy (R. Ortt & Kamp, 2022). These 7 blocks set up the provide the barriers of diffusion but still fail to provide the reasoning as to why. An example has been explained in (R. Ortt & Kamp, 2022) which essentially highlights that knowing why one of these barriers is unfavorable is not enough and it is still imperative to know why is that the case. If there are no customers, there could be many possible reasons such as, the product being too expensive, customers unwilling to spend on the product, the customers already have their needs met by another product, etc. There is still a need to understand as to why that barrier exists. The 7 influencing factors that affect the choice of niche strategy are explained below (R. Ortt & Kamp, 2022):

1. Knowledge of technology
   Refers to the technological principles in the TIS framework namely, product, production system, and complementary products. It also includes the education and training required to develop, produce, maintain, and improve the technology.

2. Knowledge of application
   Refers to knowing how the technological principles work and finding a suitable application for it. This factor influences the market in which the company operates.

3. Resources
   Refers to the available natural, human, and financial resources. Lack of any one of these resources will hamper large-scale diffusion

4. Competition
   Refers to the existing competition in the market.

5. Macro-economic changes
   Refers to economic conditions under which the company or product operates. A recession would have a negative impact on diffusion, however rapid economic growth has a positive impact on diffusion.

6. Socio-cultural aspects
   Refers to the local norms upheld by the people. These norms could be informal or cultural but have to be upheld to ensure diffusion.

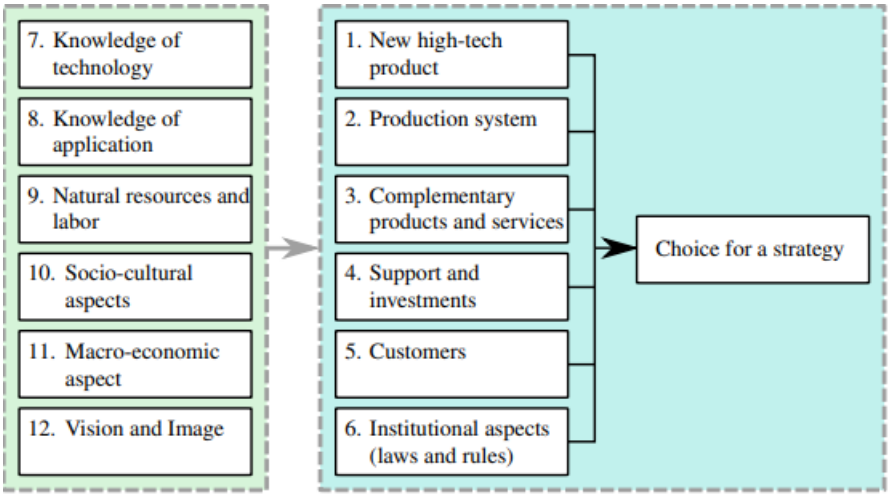

Figure 1.3: 12 factors that affect choice of niche strategies (Kamp et al., 2018).

7. Accidents or events
   An accident or event may be product-related or an event on a massive scale that leaves a lasting impact. Such as a war, or a smaller scale example would be an accident during the operation of the product. Both of these factors would influence the diffusion pattern of the product.

J. R. Ortt et al., 2013 specifies the methodology on how to choose a niche strategy for a new high-tech product. The paper lists 6 factors as core and 6 as influencing factors. They have been visualized in Figure 1.3. The factors on the right have been termed as core factors and those on the left are termed as influencing factors. The report will follow the 12 core and influencing factors identified in Kamp et al., 2018. The TIS factors when researched correctly can provide all possible information before any decision is taken. Hence, it can be said that the TIS framework aids in accounting for all the variables that would normally be considered when making strategic choices. All choices there are strategic and the information of any barrier to diffusion is included in one of these 12 factors.

1.2. Research Problem

Technological innovations have to be carefully managed to they can achieve large-scale diffusion. The management of technology entails both entrepreneurial and technical management. History has shown that even technology with great potential could fail due to poor management. The Segway is an example of the same, it was a novel technology that failed to achieve large-scale diffusion due to poor overall management. The case of Segway highlights another observation. The company used a niche strategy, made changes to the business model and yet failed to achieve large-scale diffusion. A problem has therefore been identified. New technologies need to be managed carefully the decisions regarding technical and business development have to be made cautiously as the chance of failure is relatively high given that the technology is new and has not achieved a certain level of credibility yet.

Business models have proven to be a useful tool for senior management enabling their businesses to perform better. The business model of a company undergoes constant evolution or adaptation to ensure the smooth operation of the company. The changes are driven by the strategic choices of the company, the existing barriers, and influencing factors. The change is made through employing specific strategies, known as niche strategies. The background highlights that strategies and business models may or may not be different depending on which school of thought one chooses to follow. Regardless, it has been established that the concepts of strategy and business model are inherently connected. To achieve certain strategic goals, changes have to be made to the business model. Such a relation has been identified in subsection 1.1.1 or as highlighted in Seddon and Lewis, 2003.

The research problem is identified to be the lack of literature regarding how niche strategies impact the business model dynamics. Moreover, currently, there is no method to assess the impact on the business model dynamics caused due to the implementation of niche strategies. The business model changes are unknown in relation to the niche strategies, and this poses a long-term problem of keeping the business model consistent while achieving the strategic goals of the company. The lack of understanding between these two components can stunt the growth of the company due to poor optimization of the niche strategies along with business models. In essence, by not knowing the relationship between niche strategies and business models, the maximum potential for growth or diffusion may be stunted.

1.3. Research Gap

Business model dynamics, niche marketing, and niche strategies are terms that have seen a surge in importance. However, a research gap in the literature is identified when connecting these elements. A quick search of niche strategies and business model dynamics returns results predominantly consisting of business models rather than business model dynamics. While there is an abundance of literature on niche strategies and identifying suitable niche strategies, there's a distinct link between niche strategies and business model dynamics.

Currently, there are multiple fields of research that can be combined to help build an elaborate model. There exists research into the business model dynamics of a company which aims to track business model changes over time. There is the TIS framework that identifies barriers to large-scale diffusion. Based on these barriers a niche strategy can be applied as done by (J. R. Ortt et al., 2013). These topics are different but can be used together. In this case, the TIS framework and niche strategies provide information regarding the changes that need to be made to the company to achieve large-scale diffusion. Based on the strategy chosen, the business model is changed. The changes when tracked over time can help build a model as previously done by (Kamp et al., 2021). Hence combining all of these models that have been previously built can provide a unique perspective into the functioning of the company. The topic of large-scale diffusion of companies can be approached in two ways. First, the entrepreneur will introspect their organization to better understand their strengths and optimize them. Second is the consumer perspective otherwise known as the outside-in approach. This view involves taking into consideration external factors that have an impact on the company/start-up.

TIS has an outside-in approach which is normally done in Strategic Niche Management. This is not the case for entrepreneurship research where the research normally focuses on the company's

internal factors such as the Entrepreneur's characteristics and experiences. This approach is an optimum match between entrepreneurship and strategic perspective. which combines both inside-out and outside-in approaches sequentially.
The research gap is the lack of a connection between the outside-in and inside-out approach, which in this research would translate to the lack of a link between business models and niche strategies through the TIS framework.

1.4. Research Objectives

From the research gap, the objective of the study is identified, however, it is imperative to frame research questions that can help guide the study and derive the required relationship between niche strategies and business models. Thus, the main research question is as follows:

Q: How do niche strategies and business models evolve for radically new technology-based companies/ startups?

It can further be broken down into sub-research questions.

How are niche strategies and business models related to each other?

SQ2: How do changes in niche strategies lead to changes in business models?

SQ3: How have the niche strategies and business models evolved in the case of AWES-based startups?

1.5. Scope of Research

The scope of research is meant to highlight the extent to which the research will be conducted and the extent to which the existing research gap will be addressed.

First, research will be conducted into business models and strategy. These terms are loosely defined and linked to each other. Upon identifying the difference between business models and strategy, the research focus will be shifted to understanding how strategies and business models are connected. Identifying their relationship is a crucial step before the next phase of research. Companies that have applied a particular strategy will be chosen and the criteria for the company is that the technology needs to be a new technology at that period in time. In this context "new" refers to radically new technology at the time of introduction. Some of these are startups and some are companies that launched a new technology. The companies serve as cases to help in identifying the relationship. The next step is to create a conceptual framework based on this relation. This conceptual framework is built upon the business model dynamics framework (Khodaei & Ortt, 2019). The framework will aid in visualizing the changes to the business model. The number of companies researched for each strategy will be limited. The chosen company cases will provide information that will then be combined with theoretical concepts to establish a pattern as there is a lack of credible information on the historical cases. Hence the identified pattern is a proposed relation and is an attempt to determine the impact of niche strategies on the business model dynamics of a company.

During the literature study, business models after the application of niche strategies will be considered and these considerations may or may not be related to the same industry, however, an attempt is made to compare companies in similar stages of growth or product life cycles to try and maintain consistency. The main objective of the comparison is to identify relations.

1.6. Relevance of Research

The relevance of research refers to the impact caused by the publication of this research. The relevance, however, can be split into academic relevance and relevance to the SET program.

Academically, a research gap has been identified, which is the lack of understanding of the link be-

tween the business model dynamics and niche strategies of a company/startup. There is research in each of those fields separately, and both fields of research strive to achieve the same objective of business development. The differences in approaches can be combined to provide a holistic view which could potentially lead to better and more informed decision-making. The implication of this would be seen as more successful diffusion of new technology undeterred, due to poor management of external or internal influencing factors.

This conceptual framework could potentially see applications in other sectors and not just in the AWES sector. Understanding this relationship may potentially improve the quality of decision-making by the startup and perhaps lead to better strategies. This is just a possible implication. Moreover, the research can aid in linking the existing research in management studies and can help tie up loose ends that have been identified.

The SET program is based on sustainability. Products or companies that are sustainable-based tend to have a more difficult process of achieving diffusion due to weaker business cases. Sustainability is expensive to consumers due to expensive components or raw materials(Swallow, 2022). A major problem for sustainability is the cost of the end product. The cost of the end product depends on the costs incurred to make the product, this would include additional costs such as overheads and R&D costs in addition to the manufacturing costs. This disadvantage therefore needs to be managed appropriately. The implication of this research on sustainability is indirect as this research aims to provide companies with a tool that can enhance their decision-making. It may be argued that better decision-making in terms of choice of strategy might overall have a positive impact on the company. This is said in optimism hoping that clean or green technology could potentially use this and achieve large-scale diffusion. As the technology moves further in the diffusion curve, the product cost is bound to reduce as the knowledge of technology improves, and economies of scale comes into play. Therefore, by aiding in the large-scale diffusion of clean energy technology, in essence, the energy transition is being accelerated. The implication that developing a few technologies would accelerate the transition is far-fetched, however, it is the first step towards a cleaner and greener future. The relevance to the SET program can be seen as aiding in the diffusion and development of clean technology that would otherwise be hindered by economic or technical feasibility.

The relevance of research is summarised into academic relevance and relevance to the SET program. The key points are mentioned below:

Academic Relevance

1. Identification of research gap: Found a gap that exists between multiple fields of research that can be filled.
2. Holistic view: Combines multiple perspectives from the various frameworks that can provide a holistic view.
3. Conceptual framework: The research aims to create a framework that can be utilized by companies or start-ups to help with their decision-making.

SET Relevance

1. Sustainability Enhancement: The research aims to indirectly support sustainability by providing a decision-making tool that could potentially contribute to more effective diffusion of clean technology.
2. Economic Impact Mitigation: Better decision-making can help enhance the economic feasibility of a product. Economic feasibility is a hurdle in the SET sector.

1.7. Research Methodology

The research questions have been established based on the identified research gap. The first step in this research would be to determine the ideal method to solve the identified research questions. The chosen method for each question is mentioned below. It is important to remember that the methodology

to solve the questions is discussed at a rudimentary level and will be expanded in detail for each sub-question. The research will create a new framework to be used. The TIS was introduced as a new framework and hence inspiration is drawn from it regarding the creation of a framework. (R. Ortt & Kamp, 2022) builds a framework and then validates it. The identified steps are as follows:

1. **First**: Literature study to understand the related theory and draw research-related conclusions based on theory.
2. **Second**: Building the framework based on historical examples to signify relevance or highlight past applications.
3. **Third**: Test the framework on new cases to validate it.

The above method has been identified and will be adapted for this research.
Q: How do niche strategies and business models evolve over time for radically new technology-based companies/ startups?

The main research questions are answered through the sub-research questions. These questions reflect the various steps that need to be covered before the main research question may be answered.

SQ1: How are niche strategies and business models related to each other?

Niche strategies are employed to help in the large-scale diffusion of technology. Case studies and literature have shown that when a niche strategy is employed certain components of the business models have to be changed in order to achieve the strategic goals. This relationship between niche strategies and business models will be identified through a detailed literature review. It is an optimistic approach to assume that the link may be found through literature. If the literature cannot provide enough information to identify the relation, it may at least provide answers as to where the link may lie. First, A study is conducted into niche strategies. We start with rhetorical questions such as ”What are they?” or ”Why are they used?”, these questions demand an investigation into their very nature and provide information regarding their functioning. The literature review will cover topics such as business models, business model dynamics and niche strategies in detail. There is a plethora of academic research into these fields independently. Studying these various fields could potentially uncover how or through what niche strategies and business models are connected.

SQ2: How do changes in niche strategies lead to changes in business models?

SQ1 provides the relationship between niche strategies and business models. The changes made to the business model might be limited to one or more strategic choices. The changes however have to be evaluated on the whole business model as once a change is made to a business model due to the presence of interrelationships a corresponding change has to be made in other components of the business model. These strategic and consistency-related changes led to the creation of a unique business model for the company. By studying companies that employed niche strategies in the past, it would be possible to determine the changes caused to the business model by the implementation of niche strategies. Researching historical cases could potentially provide a relationship between the niche strategies and the business model dynamics. Combining historical cases with existing literature can help in identifying the impact of niche strategies. The criteria for choosing a company have been mentioned above. The methodology for studying the historical cases has been explained in detail in subsection 1.1.1. The changes to the business model are tracked using company activities as complete information regarding the business model may not be available publicly. The problem of poor or lack of information is a major hurdle for this research. Hence the detailed methodology regarding the identification of literature is mentioned in subsection 1.7.1.

SQ3: How have the niche strategies and business models evolved in the case of AWES-based startups?

Two AWES-based startups are considered in this study namely, Kitepower and Kitenergy. The study conducted on Kitepower will be a longitudinal study and the study in Kitenergy will be not as in-

depth. These startups have been chosen to test the conceptual framework that will be built. Moreover, since these changes are tracked over time in the case of Kitepower, it may lead to interesting observations with respect to the temporal impacts of niche strategies. Kitenergy will serve as a supportive AWES case that can aid in strengthening the findings from the case of Kitepower. Further, studying 2 companies in the same sector could also provide more information about the sector of AWES. As a green energy technology that has the potential to be disruptive, understanding this market could prove vital in leading this technology into commercialization.

1.7.1. Methodology for studying historical cases

Historical cases prove to be a great source of information. In this case, the historical cases serve as examples and can help in identifying a pattern between business models and niche strategies. The first step is to identify companies that launched a brand new product that has not been seen in the market before. The companies are chosen based on the niche strategy applied. A new technology is taken and the actions of the company are studied. Based on the actions of the company and on the application of the definition of each strategy, it may be concluded that a company has or has not employed a specific niche strategy. The strategy employed by the company is verified through company actions, statements, or interviews with the entrepreneurs. Unfortunately, the information is obtained from non-academic literature. The process of identifying the literature has been explicitly described in the following subsections.

If a company has chosen a particular niche strategy then the company is further researched by applying the TIS framework to determine the barriers faced by the company at the time of application of the niche strategy. To confirm if the niche strategy has been used or not, the further actions of the company after the choice of niche strategies are investigated. The company's actions serve as indicators of a change in the business model. The addition of new resources or a new pricing model are examples of activities taken by a company that can be clearly associated with a change in the business model.

Now that it has been understood how the companies are studied, an attempt is made to explain how these connections to the business model are made based on information. Information is vital in studies and for the companies themselves, and hence information such as business models is not shared publicly. Due to this interpreting changes becomes difficult. Hence to work around this issue, the company's actions are considered. The sources for such information are the companies themselves, research studies, and gray literature. Once an action has been taken on the part of a company, the implications of that action are studied to determine what has changed. The information, if obtained from gray literature is verified by confirmation from multiple sources to ensure accuracy in model building.

Once a company is identified for each niche strategy, the research is done to identify the changes caused in the business model. The findings of the historical cases are then combined with the knowledge regarding the niche strategy from literature to try and identify a pattern between niche strategies and business models.

1.7.2. Application of TIS Framework

The method of application for evaluating companies and model building is inspired from (R. Ortt & Kamp, 2022). First literature is studied on niche strategies and based on their definition historical cases are identified where these strategies have been applied. The TIS framework is then applied to these companies to identify their barriers and influencing factors.

Second, Each of these company cases will then be researched and based on available literature and gray literature. The business model change linked to the niche strategy will be tracked. For this reason, to keep information consistent, all the searches are time-filtered to the time period under investigation.

After step two, a proposed model would be identified that connects niche strategies and the business model elements. By comparing the changes with their previous variant, the business model dynamics can be assessed and therefore visualized. The visualization will be done by employing a framework

that builds on the existing business model dynamics framework (Kamp et al., 2021).

1.7.3. Literature Identification

The creation of the framework first requires sufficient background knowledge. Beyond this, the model is built part by part. The first part is to study business models and how they come about. There is plenty of literature regarding business models and hence a comprehensive study can be conducted into them. Second, we differentiate between business model and strategy. As highlighted in the background, there is a difference between strategy and business model. It is imperative to understand these differences and how they affect one another. The research then shifts focus to niches and niche strategies. Niche strategies are employed by a company in reaction to certain conditions. A study will be conducted into what these specific conditions are that prompt the choice of a specific niche strategy. These conditions can be studied by employing the TIS framework. The frameworks aid in identifying the market conditions that require a specific niche strategy to overcome. Past examples are then considered to trace a relation between the application of a specific niche strategy and the respective changes in the business models.

There is a specific problem that has been identified in the study of past companies. Every company employs niche strategies, however, not every company can produce academic literature regarding their choices. Their choice instead must be seen as choices and the company as a research subject. Hence the problem is the lack of academic literature. For example, a query that would be searched to research past companies would be one regarding the business model changes in response to the implementation of a niche strategy. It is an optimistic search which gives no results. Hence, the method to go about the research about the past companies would be to resort to what academia terms ”Gray” literature. Grey literature covers the following:

1. Reports
2. Dissertations
3. Patents
4. White papers
5. Newsletters

Other sources of information would also be company activities as it serves as the visual representation of changes in business models. This highlights the second problem with the study of past companies. There is a lot of information that is obtained from this literature, however, the information about business model changes is missing. Instead of information, the change is seen in terms of the changes the company takes in its activities. An example of such would be the case of Nobel. He moved to a different country and met two people who facilitated the set-up of a factory. Such an action can be inferred as Nobel acquiring a new key partner. The new production facility would be an addition of a new key resource. Hence information will be interpreted as explained above in the example. Any outlier or unique data will be explained in the specific section if needed.

Google scholar, Willey’s library, jstor, and emerald have all been used to search for relevant information. Study relevant information on these websites is scarcely and in most cases unavailable. Grey literature has been filtered to reliable sources that are published by NGOs or any other organizations. The search results in a large number of articles that explore the theory rather than the changes in the company and hence most of these are unusable. A search for a query for example ”business model changes in IBM”, returns results that are not fully relevant as the results explore theory but fail to trace the history of their business models. Further, if some sources are considered unreliable, the information is verified by confirming it across multiple sources to see if its valid. Further, there does exist some academic research, however, the information that is required cannot be obtained and an example of such a case would be Tesla. There are multiple researches done on Tesla however, the required information cannot be identified clearly. Tesla employed various niche strategies, there is literature regarding the actions taken by Tesla but these actions cannot be traced to a particular nice strategy as the actions taken are mentioned cumulatively. In such cases, time-filtered gray literature has been used.

The identified relation serves as a connection between niche strategies and the components of the business model. This relation is further used to create the business model dynamics framework with respect to niche strategies.

1.7.4. Application of Conceptual framework

The framework is created based on the information obtained from theory and the companies and is applied to the company's theme selves to visualise the business model dynamics. The visualisation will aid in observations and suitable inferences if any. It is expected that the application of the framework could lead to potential observations of any new relations. It is expected that through the visualisation, a fixed path may be obtained that points towards the components that require change due to the implementation of the niche strategy. The historical cases act as a validation tool for the framework. After application to these historical cases. 2 AWES startups are chosen, and the framework is tested on these 2 startups namely "kitepower" and "kitenergy" The findings and model are applied to the startups and compared to the proposed model.

1.7.5. Methodology for AWES-based startups

The research uses two AWES-based startups as case studies to which the conceptual framework will be applied. This would mean that these companies need to be studied.

Kitepower is a TU-Delft-based startup, due to which access to the company is easier compared to other cases. Kitepower has been a subject in many studies and research and hence there is plenty of information available. The company was evaluated as part of a course titled "Technology Entrepreneurship and Innovation", the course overlaps some topics covered in this research. Reports from this course serve as a periodic revision of the status of Kitepower. The data from these reports was first verified to ensure, the data used is correct. In this context verify refers to whether it has been done correctly. This would include checking the references and the argumentation to ensure logical consistency. The reports are periodic and hence every three months a new report is there. A method of verification used is that these reports build or identify the same pattern or trend. The later ones build on the previous ones. This provides a base level of confidence that the information cited in the older reports is factually accurate. An interview will also be conducted with Kitepower. The preferred candidates for the interview are the CEO, COO and head of business development. They are the individuals who can provide the information required in this study.

Kitenergy is another AWES startup that is being studied. Unfortunately, no extra information is available and hence the methodology for studying kitenergy is the same as that used for the historical cases. First, the TIS framework is applied to identify the barriers to large-scale diffusion. Following this, a choice of niche strategy is made. The choice of niche strategy is assumed based on the TIS factors and the actions of the company. The actions of the company are based on the strategic choice made and hence, the actions can be associated with a certain niche strategy. Attempts are made to validate this based on confirmation from any official sources.

1.7.6. Thesis structure

First, a preliminary study is conducted to understand the research problem and scope. This is done in Chapter 1 which serves as the introduction. It offers necessary background information and formulates research questions while outlining the chosen methodology. Chapter 2 is the literature review, the objective of the literature review is to understand the existing literature and draw inspiration from it that guides this study forward. In this research, the literature review includes an in-depth study of the underlying concepts covered in the thesis along with the identification of companies that have applied certain niche strategies. Chapter 3 is research based on historical cases. The TIS framework is applied to historical cases to determine their barriers. The niche strategies are chosen as a result of these barriers and actions are taken to implement them. These actions highlight the connection between business models and niche strategies. Chapter 3 will propose a relation between niche strategies and business models. Based on the understanding of the previous chapters, a conceptual framework is built. This framework has been discussed in depth in Chapter 4, however, the framework application has been done in Chapter 3 to illustrate its use using historical cases.

The created model is applied to two companies, namely, Kitepower and Kitenergy in Chapter 5. Kitepower is a TU Delft-based startup and hence, there is a plethora of information available for Kitepower, due to this, the case of Kitepower will be investigated in a higher degree of detail compared to Kitenergy. Finally, Chapter 6 concludes the thesis by recapping key points and emphasizing the significance of the research.

2

Literature Review

The background information has been presented to provide a basic background of the necessary concepts. Further, the research gap, problem, and questions have been discussed. From the discussion, it was established that a detailed literature review can provide answers to some of the research questions. First, the difference between business models and business strategy is looked at in detail. The business model is looked into extensively along with its various components. A brief research is also conducted on the existing business model dynamics framework. Finally, the research is focused on niches, niche strategies, and their impact.

2.1. Business model

The definition of a business model has been somewhat vague, but it has recently been properly defined. There are various definitions for business models, and they have been summarised in the following Table 2.1, with the components of the business model identified. The definitions mentioned in the following table have been obtained from (Casadesus-Masanell & Ricart, 2010),(Teece, 2010),(Chesbrough, 2010),(Osterwalder et al., 2005),(Slavik & Bednár, 2014), (Geissdoerfer et al., 2018), (Gorevaya & Khayrullina, 2015). The definitions are similar but slightly different in each case. In this research, however, the definition of business model is adapted from David Teece, as this definition breaks down the business model into 4 components. These 4 components are applied to the business model canvas by Osterwalder et al., 2011. The canvas used in Figure 2.1 is the one used in the paper for the case of a software company. 4 distinct boxes can be observed from Figure 2.1. These are the 4 elements that will be discussed in detail.

Definition	Reference/ Authors
For investors, the business model is a way to evaluate whether the company will reach success. For a businessman, it serves as a tool for creating a dynamic company	Debelak, D
The concept of business model - a unified unit of analysis, which helps to understand the process of creating value, which is the result of attracting many kinds of resources and the result of many processes. Organization's business model - is the logic connection resources and capabilities to consistently achieve their goals and carry out business activities... It's such a configuration of resources and abilities that will allow us to create unique value.	Prakhalad, K., Ramasvame, V.
Business model - a understanding of how the organization is doing (or intends to do so) the money. The business model describes the value that the organization offers a variety of customers, reflects the ability of the organization, a list of partners that are required for the creation, promotion and delivery of value to customers, relationship capital that required to obtain a stable stream revenue.	Osterwalder, A, Pene, I.

A business model articulates the value of proposition, defines the structure of the value chain required to create and distribute value, it details the cost and revenue structures of the company, it targets a specific market segment.	Chesbro, G.
Business model - this is how the company chooses the consumer, formulates and delineates their proposals, allocates resources, defines what tasks it can perform itself and for which have to involve experts outside the market,creates value for the customer and receives profit. Companies can offer the products , services or technology, but this proposal is based on an integrated system of actions and relationships, which is the company's business model.	Slywotzky, A.J.
The business model is the sum of the responses, which the company gives to the three related questions. Who should be my target audience? What products or services I have to offer our customers and what should distinguish my offer? How can I do this efficiently?	Markides, C.
A business model articulates the logic, the data, and other evidence that supports a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value.	Teece, D
Business models are, at heart, stories that explain how enterprises work. Like a good story, a robust business model contains precisely delineated characters plausible motivations and a plot that turns on an insight about value.	Margretta 2010
A business model describes the operations of a company, including all of its components, functions and processes, which result in costs for itself and value for the customer.	David Watson
'A business model depicts the content, structure, and governance of transactions designed to create value through the exploitation of business opportunities.	Zott and Amit
The business model is a machine for making money, but money is important not only to produce but also to appropriate. Business model visualizes company as a place of decisions and consequences, it is a group of resources and activities in the varying degrees of detail and operational view, which result and serve to offer value to customer.“	Stefan Slavik

Table 2.1: Definitions of business model.

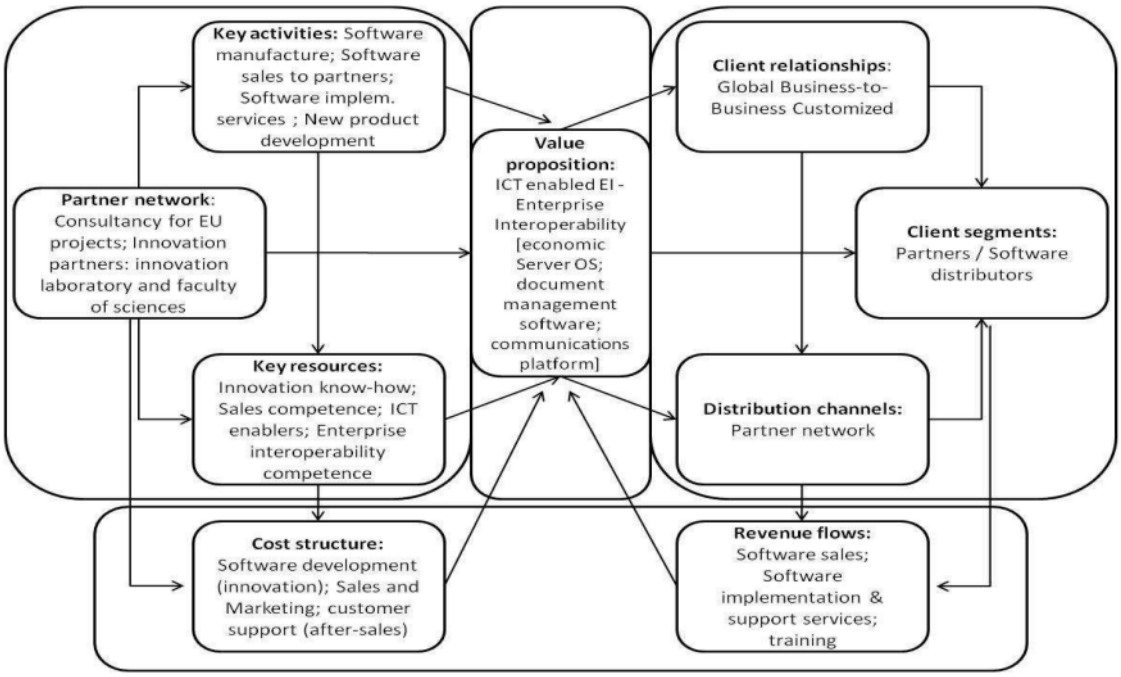

Figure 2.1: The business model canvas first used by Osterwalder et al., 2011.

1. Value proposition
   The value proposition is defined as a promise made by the company to a specific customer segment that a certain value will be delivered. The term was first proposed by Lanning and Michaels in 1988 (Osterwalder et al., 2011). There is also a canvas proposed by (Sales et al., 2017).

2. Value Creation
   Value creation refers to all the activities taken by the company to create value. The value created must be greater than the value lost through the activities. The value lost refers to the costs incurred to perform a certain activity that creates or adds value (LEPAK et al., 2007).

3. Value capture
   Value capture is defined as the process of securing financial or non-financial value from value creation. Value capture refers to the cost and revenue streams of a company within the business model (Chesbrough et al., 2018).

4. Value delivery
   Value delivery refers to the methods employed by the company to deliver the value created by it.

The above 4 components are part of the business model along with the 9 elements defined earlier. The 9 elements can be considered as a subset of these 4 components. This relation has been identified and visualized in Figure 4.1 (Bocken et al., 2015).

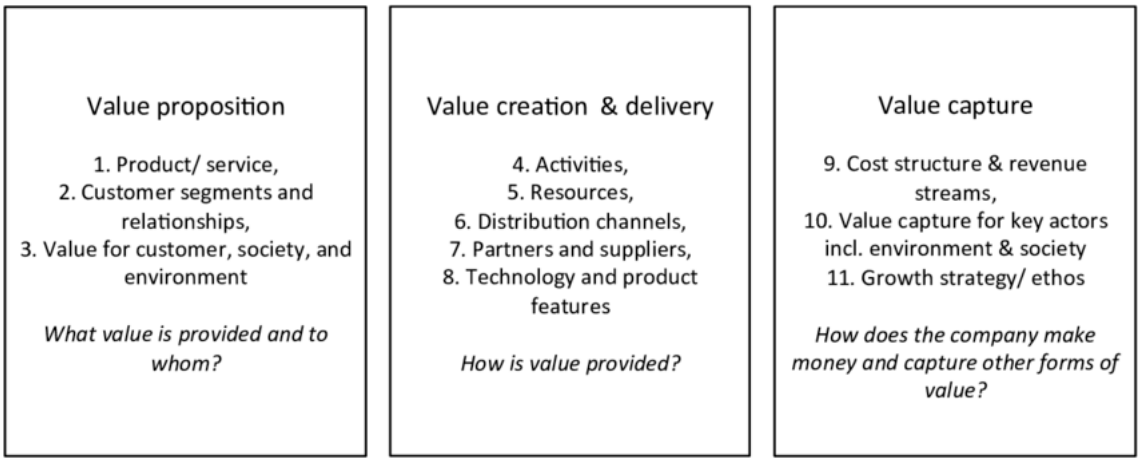

Figure 2.2: Classification of the 9 elements into the 4 components(Bocken et al., 2015).

The above 9 elements have been classified into the 4 components for ease of visualization in the business model dynamics framework. Value creation and value delivery are considered one block in Figure 4.1, although they are different in practice. For example, if an activity undertaken by the company is considered, it is part of the key activities of the company, however, it is important to consider if the activity creates value or aids in its distribution. A clear example would be an e-commerce company, its partner that supplies goods is involved in the value creation and the partner involved with delivery would be considered a part of value delivery. Hence it is imperative while studying the changes of business models to determine if the key element in question is involved in the value creation or value delivery.

2.2. Business model and Business Strategy

”Today, ’Business model’ and ’strategy’ are among the most sloppily used terms in business” as stated by Magretta, 2002. There is plenty of ambiguity in these terms. There are different schools of thought regarding business models and business strategy, it has been discussed to a brief extent in subsection 1.1.1. Micheal Porter a renowned strategist provides various definitions of strategies, however, when summarised, a generalised definition can be obtained. Porter essentially argues that strategy involves defining a company’s long-term position in the market. It involves the company making trade-offs of what it can and cannot do, the result of a strategy is to obtain a superior return on investment (Seddon & Lewis, 2003). (Balboni & Bortoluzzi, 2015), (Amit & Zott, 2001) also provide a good differentiation between strategy and business models, **companies compete through their business models and the strategy of a company emphasizes the competitive dimension in the market**. The definition is therefore understood to be as follows. The strategy of a company defines the end goal and the business model is the path taken to achieve this goal.

2.3. Business model dynamics

Business models have to change for the company/startup to thrive or remain profitable (Teece, 2010) These changes can have different natures (Saebi et al., 2017). The changes are of varying nature but the result obtained is that the company now uses a new business model. These changes are of 3 types as specified by (Saebi, 2014). they are :

1. Business model adaptation
   Refers to the set changes made to the business model as a result of strategic choices made by the company. These changes can be related to a company’s organizational structure, marketing strategies, activities, and networks. These changes can also be internal and external in origin (Saebi, 2014)(Landau et al., 2016)(Saebi et al., 2017).

2. Business model evolution
   Refers to the implementation, replication, standardization, and maintenance of the existing busi-

ness model. The changes are limited to a few components at a time and may or may not affect the core components of the business model (Saebi, 2014)(Demil & Lecocq, 2010).

3. Business model innovation
   Refers to the novel conceptualization of a company's value proposition, value creation, value delivery, and value capture (Andreini et al., 2022),(Teece, 2010)(Grabowska, 2015) that does not resemble or is similar to any current existing model. These changes or business model is considered to be "groundbreaking".

Having understood the types of changes, it has to be said that these changes will not be specified or visualized individually. The various business model changes will be considered just as changes to the business model and their nature will not be considered in detail in the conceptual framework. The reason is that the framework is a tool to visualise changes and an innovation, adaptation, or evolution all lead to the creation of a new business model. The extent of novelty in each of these changes may be different but the result is that a change is visualised or highlighted.

2.4. TIS Framework

TIS stands for technical innovation system, it is a method to identify external barriers and factors that hinder the large-scale diffusion of a product. An application of the framework is done by (R. Ortt & Kamp, 2022). The paper identifies a few technologies that serve as test subjects for the framework. It is seen that that framework covers most external barriers to the company and by using the framework, it provides more information which is vital towards the choice of niche strategy. The TIS has been covered in the section 1.1. More information regarding its application is to apply it properly.

2.5. Niche strategies

Niche is a concept that comes from marketing and has been defined earlier. Niche strategies on the other hand are those strategies employed by high-tech companies that operate in strategic niches. The purpose of these niche strategies is to overcome any barriers to large-scale diffusion that exist(Kamp et al., 2018). Strategic niches are defined as the phase before large-scale diffusion is achieved but after the product has undergone introduction(Vinitila et al., 2017). Before large-scale diffusion of the product is possible existing barriers in the niche need to be overcome (J. R. Ortt et al., 2013). This is done by the use of what is termed niche strategies. (Noy, 2010) goes on to argue that the use of niche strategies has been linked with improved business performance. **Niche strategies are chosen based on a combination of the core factors and influencing factors (J. R. Ortt et al., 2013).** The combination of the cause and barrier is provided by the TIS framework for the choice of niche strategy. Based on J. R. Ortt et al., 2013, ten generic niche strategies have been identified that can aid in the large-scale diffusion or commercialization of high-tech products, a brief description of under which conditions they may be applied is also specified below.

1. **Demo, experiment and develop niche strategy**

   The product is demonstrated in a controlled environment to ensure good performance, improve public image, and also develop the product. This strategy is implemented when the knowledge of technology is lacking and requires further development.

2. **Top niche strategy**

   The product is sold to a smaller customer base at higher prices to keep production. This strategy is employed due to the lack of knowledge of technology. The product is sold at higher prices until the knowledge of technology is developed to make it price competitive or reasonably priced.

3. **Redesign Niche strategy**

   The product is redesigned to fit the needs of a new market segment, the niche strategy is employed if the knowledge of technology is lacking, thereby causing issues in the production systems

or the price of the product. The strategy could also if the knowledge of application is lacking and hence the redesign may have a positive impact on the product performance in the market. Socio-cultural norms also play a factor as they affect the availability of network formations or customers. The strategy would also be employed in cases where there is an issue with the institutional aspects, these can be that the product may not comply to certain rules, regulations or standards set by the governing institution.

4. **Subsidized niche strategy**

   The strategy makes use of public funds through subsidies that firm may avail given that certain conditions are met. The effect of the strategy is more money is spent on the development or the price of the product is reduced due to the subsidies. This strategy is beneficial if there exists a lack of resources and/or the lack of knowledge of technology.

5. **Stand-alone niche strategy**

   The strategy aims to use the product in stand-alone mode. This strategy is employed if there is a lack of complementary products and technology. Lack of resources and knowledge of technology could also be reasons why this strategy may be needed.

6. **Hybridization niche strategy**

   The strategy aims to use the product in combination with an existing product or service. These maybe complimentary products and services as well. The strategy is implemented if there is a lack of knowledge of technology or lack of resources.

7. **Geographic niche strategy**

   The strategy aims to change the market based on location or regional factors. This strategy may be employed due to poor institutional support,availability of complimentary products and services, lack of resources, socio-cultural aspects or any accidents/events.

8. **Educate niche strategy**

   A strategy to transfer necessary knowledge about the technology to suppliers or customers. This strategy is employed when there is a lack of knowledge of technology which has a direct impact on the suppliers and customers.

9. **Lead user niche strategy**

   A strategy aimed at lead users meaning, the product users are limited to small number of experts that can further develop the product. This is employed when the knowledge of technology is lacking or the knowledge of application maybe lacking, this strategy also impacts the consumer knowledge of the product.

10. **Explore multiple niche**

    The strategy aims at entering the same product in different market applications to find the most suitable fit. This strategy is most commonly used if the knowledge of application is lacking. This could also be extended to the customer base. A lack of customer base could potentially lead the firm to explore new markets.

The theoretical definition provides a good deal of information, and an attempt is now made to identify examples of companies or technologies that have applied the niche strategy. The findings are best summarized in Table 2.2.

Niche strategies	Description	Case	Cases and references
Demo and Develop niche strategy	A strategy to demonstrate the product in public in a controlled way so that the limited quality or performance is not a problem. An important part of the strategy is experimenting with the product to develop it further.	Telegraph	The product was initially demonstrated multiple times while undergoing development. (J. R. Ortt et al., 2013) (Dordick, 1990)
Redesign niche strategy	A strategy to redesign a product and position it in a different application to better fit the market situation. The redesign can refer to a simpler version, which can be produced at a lower price. A redesign can also be created for an application in which it better conforms to the market situation.	WD40, Post-it notes	WD-40 initially was designed for aero-space use. Later adapted to home use after making some adaptations to the original product after a new application was found. (WD40, 2023) Post it-notes was initially a glue that left no residue. The glue was the product and after various redesigns finally the post it notes that exist now was created. (Lavangar, 2016) (Mertes, 2023)

Stand-alone niche strategy	A strategy to use the product in stand-alone mode, or as a dedicated system combining necessary complementary products and services. For example, a local network if the infrastructure is not available on a wider scale.	Tesla, GoPro	Lack of chargers stopped Teslas growth, they set up their own charging network to reduce dependence on external Services/factors (Musk, 2006) GoPro compatibility was limited. They expanded services to include cloud storage and image editing software to make the product a stand-alone product
Hybridization or adaptor niche strategy	A strategy to use the product in combination with an existing product, allowing the use of existing complementary products and services. For example,providing an adaptor to make the product compatible with existing products. (Boyle, 2019) (George, 2021)	Toyota Prius, Alexa	Hybrid cars act a an intermediate step in moving towards electric vehicles especially prominent due to lack of electrical vehicle infrastructure (J. R. Ortt et al., 2013) (Furr & Snow, 2015a) Alexa was an AI, that did not have a suitable use. Amazon tried to use it in other products and integrate it with them. (Hamblen, 2022) (C. Gray, 2022) (Kim, 2016)

High-end niche strategy	A strategy to make a small number of products to order, for a high-end segment,also referred to as ‘skimming’. For example, offering hand -made products at a high price in advance of a cheaper, mass-produced version.	Tesla, Fitbit	Tesla began in a high end market with their initial product being sports car that was expensive. The company chose to serve a small market with high profitability. (Musk, 2006) Fitbit sold its initial batch of watches for a very high profit margin. The extra money helped set up a product system for fitbit that lowered the product cost. (Marshall, n.d.)
Educate niche strategy	A strategy to transfer the necessary knowledge about the technology to suppliers or customers.	IBM, Arduino	IBM offered classes and course for people, made the product open source, so people could develop original ideas. (IBM, 2023b) (Anand, 2021) Arduino had many applications, too many infact. Hence, they opted to make it open source, this allowed people to use it for anything. They offered to teach and even held arduino board related competitions to encourage use and learning. (Barragán, 2023)

Lead user niche strategy	A strategy aimed at innovators or lead users, whereby the product can be co-developed. Firms can learn about suitable designs, as these highly involved and expert users experiment with the product and develop it further.	Street Scooter, DCT	Streetscooter partnered up with DHL to make delivery vehicles unique to DHL. (DHL, 2019) (J. R. Ortt et al., 2013). The DCT was first used by the race team as customer and then developed accordingly. It was deemed unfeasible at that time due to technical limitations.
Explore multiple markets niche strategy	A strategy to try out multiple market applications and by trial and error find successful applications. When the first applications are visible, this may stimulate use in new applications.	Segway	Originally designed to replace cycles for personal use. Later focused on niche application like tourism and security. (Isegway, 2020) (US, 2020)
Subsidized niche strategy	A strategy to subsidize the product development with public funds. This is possible if society considers a particular segment of customers' use of the product relevant or important.	Tesla, Clean energy technologies	Tesla makes use of subsidies to reduce product price and develop their product. (Tesla, 2020) (Fernholz, 2023) Clean energy technologies receive government subsidies that aid in keeping the technology economically feasible. (J. R. Ortt et al., 2013)

Geographic niche strategy	A strategy in which the choice of market is based on local or regional characteristics, for example, when a product launch is moved to another geographic area where resources, suppliers, or customers are available.	Dynamite	Alfred Nobel moved to Scotland after an incident in Sweden which made him realize that Sweden was not the ideal market for him due to regulatory issues. He moved to Scotland and established a company there. (J. R. Ortt et al., 2013) (Dolan, n.d.-a)

Table 2.2: Literature review findings

2.6. Conclusion

The literature review is meant to provide all the necessary theoretical information needed to continue this research. In this chapter, the topics covered included business models, business model dynamics and niche strategies. Based on theoretical knowledge of the strategy and from a literature study into business models, it may be concluded that they are indeed related. The relation has been hypothesised earlier, however from historical cases and literature, it was identified, as to where the link lies between the two. Further looking at the historical cases in detail may aid in further determing the relationship.

3

Historical Cases

To understand the relationship between niche strategies and business models, past examples have to be considered. Case studies for each of the niche strategies have been identified and explained below. The application of the conceptual framework to historical cases aids in identifying the impact of a niche strategy on a business model, further, the second application is done on Tesla which has employed multiple niche strategies, this case provides a glimpse into visualising the impact on the business model dynamics of a company over time. The methodology employed for identifying and applying historical cases is discussed below.

3.1. Business model dynamics framework

The conceptual framework that is built in this research is first applied to historical cases. A detailed explanation is provided in the next chapter. The framework makes use of colours and symbols. The details of this can be found in Figure 3.1.

3.2. Relation between niche strategy and business model

Based on theoretical definitions and past cases that have been studied, it may be possible to trace out the desired relationship. The company cases have been identified in the literature section and highlighted in Table 2.2. The interpretations are done based on available information for the product/company. The TIS framework is applied to the identified companies, to determine their existing causes and barriers, before the change in niche strategy. This provides a picture of the existing conditions before changes. The changes in the business model are then identified based on the actions. Hence the steps are 2-fold. First, apply the TIS Framework to identify the barriers and influencing factors. Second, Identify or interpret changes to the business model that would aid in establishing a relation between niche strategy and business models. A brief background on the company is provided, following which the TIS framework is applied, based on the findings from the case description.

The relation between the niche strategies and the 4 components is yet to be determined. This will be done on a case-by-case basis for each of the niche strategies.

1. Demo and Develop niche strategy

   The Demo and develop niche strategy for a product involves the product being demonstrated, this could be a proof of concept for the company. The strategy involves taking feedback from the demo users to further develop the technology. A form of demo and develop strategy is used by many companies to test out their product. An example that loosely fits the criteria would be a software company that beta-tests its product. In the case of beta testing, the product is released to the public or a small test of beta testers. They use the product and provide feedback to the company. From the understanding of the definition of the strategy. Demo and develop involves

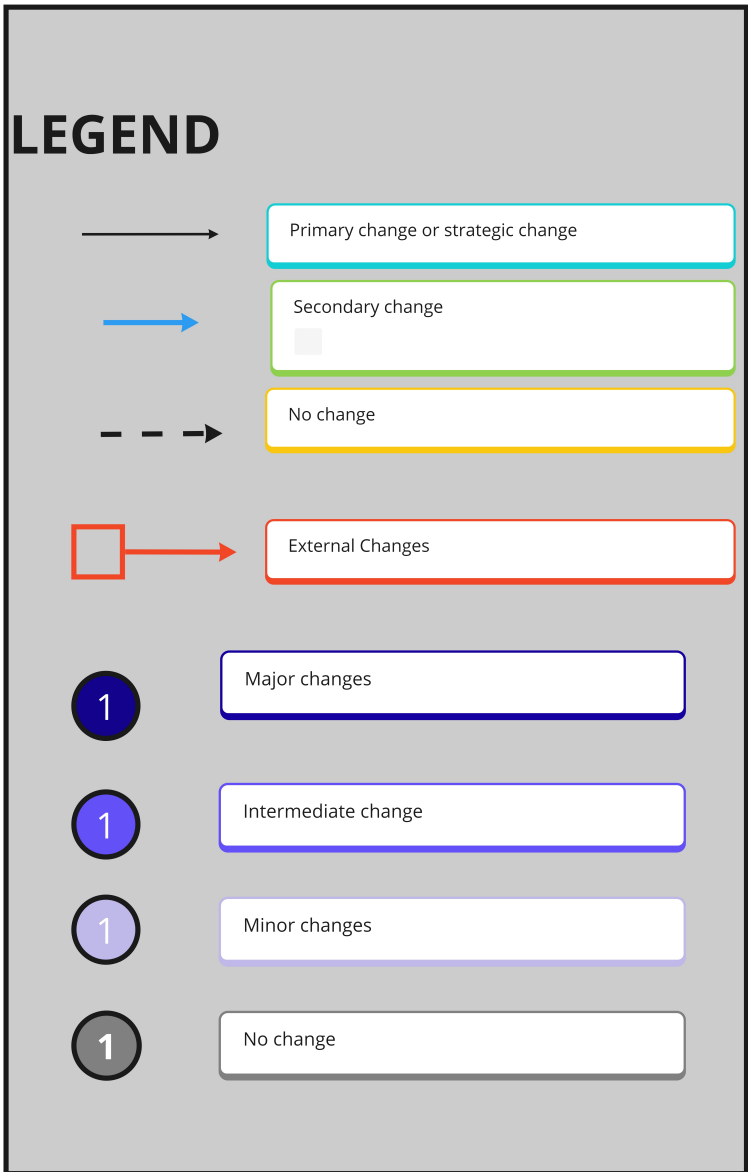

Figure 3.1: Legend for the business model dynamics canvas.

the product being demonstrated and through these demos, it undergoes testing and further development. Based on this definition, it may be logical to make 2 assumptions. First, the value proposition changes due to development. The second is that value creation could change due to the addition of value, this could be in the form of personnel or even intellectual property. The creation of new intellectual property could potentially lead to a product. It can also be interpreted from the definition that, since feedback may need to be collected, new communications channels may need to be set up, this reflects a change in the Value delivery. All of the above actions come at a cost, further, if the product can be commercially sold, it would mean that the value capture may also be subject to change. This is based on the understanding or the interpretation of the definition.

The story of telegraph

The case of the electric telegraph is a good example to understand the effect of this niche strategy. The electric telegraph was made by Samuel F.B Morse in 1832(Congress, n.d.) (Congress, 2009)(Nonnenmacher, 2009) (Du Boff, 1980). The technology was conceived but received little to no attention in its early stages. Morse travelled from America to Europe in an attempt to demonstrate the product to various markets, but this did not result in immediate success. Morse demonstrated the capabilities of the telegraph between Washington and Baltimore. The 'strategy' used by Morse can be considered the first known example of demo and develop experiment(Dordick, 1990). Morse demonstrated the technology around in various settings but realised that technology was not ready yet and was undergoing further development. In Morse's words, he believed that the innovation wasn't a failure, nor was he a poor businessman. Instead, he attributed its challenges to the advancements in science required to make the technology viable. Based on the above case, it can be said that the **knowledge of technology**, and **complimentary products and services** were existing barriers. **Institutional aspects** were considered only partly complete as there were no regulations that prevented this technology from being applied as it never saw application. **Customers** are also considered partly incomplete as from Morse's demos it was clear that there were customers who were willing to use the service for various purposes such as personal communications and even official communications(the proceedings of the Democratic National Convention), the main problem lied in the technology itself as it was not fully ready, there was no new high tech **product** that could be sold commercially. The telegraph was under constant development all while also being demonstrated around the world. It has been established that the company made use of the demo and develop niche strategy. Various actions can be observed to be taken by the company which can then be associated with the change in the business model. Morse's travelled around the world to demo the product in various places. Morse partnered up with the government after 1938, where he received funds from the government to build products to prove the technology. New people were brought to the company to try and make a product that could now be made economically valuable. This meant that new hires were made in technical and management fields by hiring a technical expert in Leonard D. Gale and Amos Kendall to develop the business. Alfred Vail was another key individual brought on to the project. This represented new partners or new assets that contribute to a change in value creation. The product was being developed to make it more reliable and cost-effective, this represented that the value proposition was also changed. Alfred Vale had access to Ironworks through his family business and was involved in the manufacturing of telegraph(MIT, n.d.). Moreover, Kendall, after taking charge put in place a new revenue model representing a change in the value capture. Kendall also devised a new method to deliver the messages through a centralised hub based in New York, thus changing the value delivery. Based on all these changes, in this case, it can be concluded that the demo and develop resulted in a change in the Value proposition(VP), Value creation(VC), Value delivery (VD) and value capture(VCA)

(a) Value Proposition(VP): The value proposition changed as the product development continued.

(b) Value Creation(VC): New people who were bought into the company had specific jobs to undertake. They acted as new key resources that bettered the functioning of the company or in fact gave the shape of a company to an idea.

(c) Value Delivery(VD): A centralised hub was created to help streamline services and improve

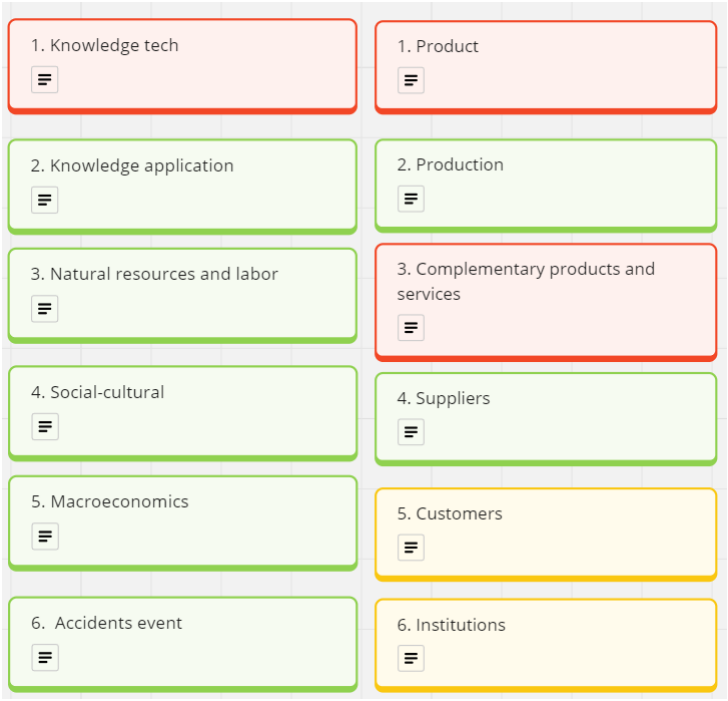

Figure 3.2: Influencing conditions and TIS building blocks for Telegraph

the delivery of the messages, thereby contributing to a modified value delivery system.

(d) Value Capture(VCA): As the product was ready. A new form of revenue was made available through the telegraph. The new revenue was the cost of sending a telegraph that was borne by the customer. This opened up a new revenue stream for the company.

From the above example and the understanding of the niche strategy itself. A pattern may be identified. Given that this model is built on a small set of companies and from theoretical definitions. The identified pattern that is proposed as the pattern demo and develop is as follows. The demo and develop niche strategies have an impact on the 4 elements of the business model. The value proposition, value delivery and value creation.

Based on identified changes, the previous framework for business model dynamics can be applied in conjunction with the TIS indicators to plot the business model changes due to the implementation of a niche strategy. The impact of the niche strategy on the business model of the telegraph is visualised in Figure 3.3

These are the identified changes which may be generalised as the impacted components by application of the demo and develop niche strategy and can be visualised as seen in Figure 3.4. The identified impacted barriers are knowledge of technology, product and production systems. This is the case for telegraph, it however may differ for other products or services that operate in a different industry. These are the identified changes which may be generalised as the impacted components by application of the demo and develop niche strategy and can be visualised as seen in Figure 3.4. The identified impacted barriers are knowledge of technology, product and production systems. This is the case for telegraph, it however may differ for other products or services that operate in a different industry.

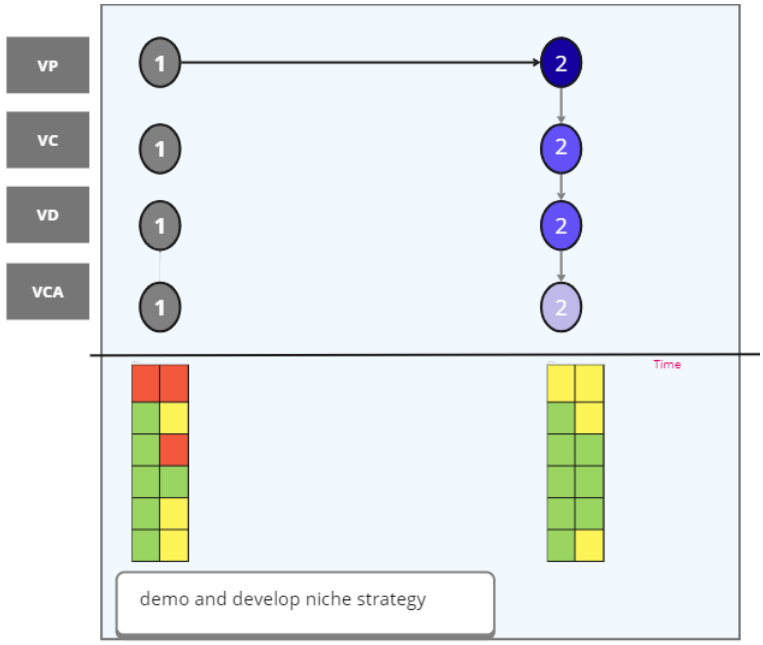

Figure 3.3: Telegraph business model changes due to the implementation of demo, develop and experiment niche strategy

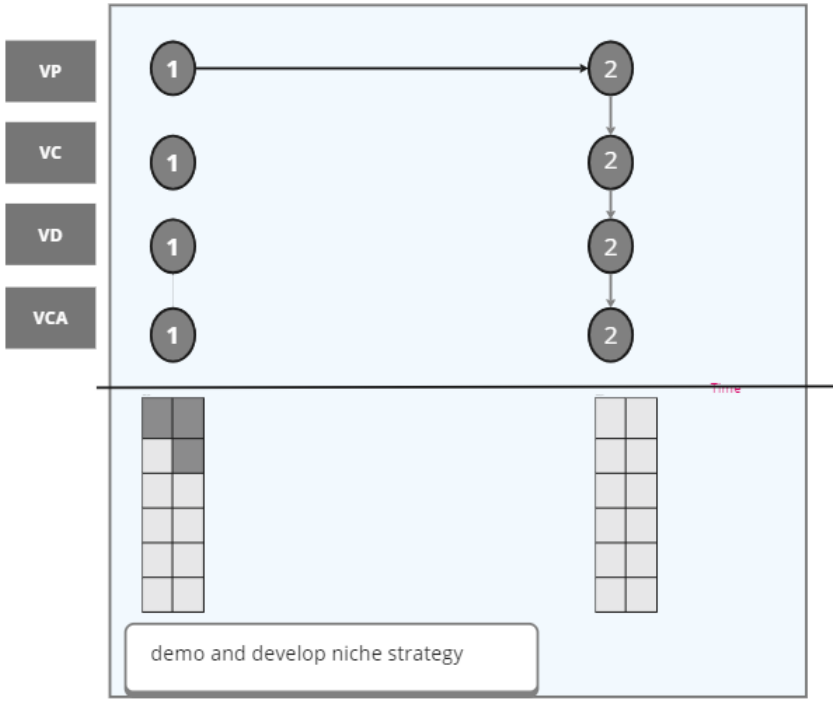

Figure 3.4: Proposed impact of the implementation of demo and develop niche strategy on the business model.

2. Redesign niche strategy

The redesign niche strategy is employed and it would imply that a product that exists in one domain undergoes a redesign to either fit a new application or to better fit its current application. Based on the definition, it can be concluded that the VP changes given that the product is being redesigned for a new market or application. Providing a new value would logically require creat-

ing said value, the company setting up any new facilities to ensure the new redesign would work is what would come under the value creation block. Moreover, when entering a new market, it may prove to be difficult considering that the old channels may not work or may be inefficient. Hence, new communication channels need to be set up by the company. Finally, entering a new customer segment or changing the product value proposition may often be linked with a price change of the product. This could be the case due to the added VP being expensive to implement.

The story of WD-40

WD-40 stands for water displacement and 40 refers to the version of the product that worked. It was created by a Rocket Chemical company in 1953. The first company to use WD-40 commercially was Convair, a company in the aerospace sector. The use of the product was to protect the outer skin of the Atlas missile from rust and corrosion. It was an outer space application or a niche application. The product was a success, it was later found that several employees used to sneak cans out of the plant for their personal use at home. A few years later, the company founder identified a new market, individual consumers in their own homes or workshops. This proves that while the product was ready, there was a lack of **knowledge of application**. Since the product was sold exclusively for rocket applications, the number of **customers** was also limited. It was only discovered later that WD-40 had household applications upon which the company worked on a minor redesign for the formula which allowed it to be used with aerosol cans. The aerosol cans made it easier to use in households or even tight spaces which were normally difficult to reach. The product was an efficient one to begin with however, the conversion to an aerosol form made it more usable. Hence even the **product** before the redesign can be considered as a factor that held back the diffusion rather than as a barrier entirely.

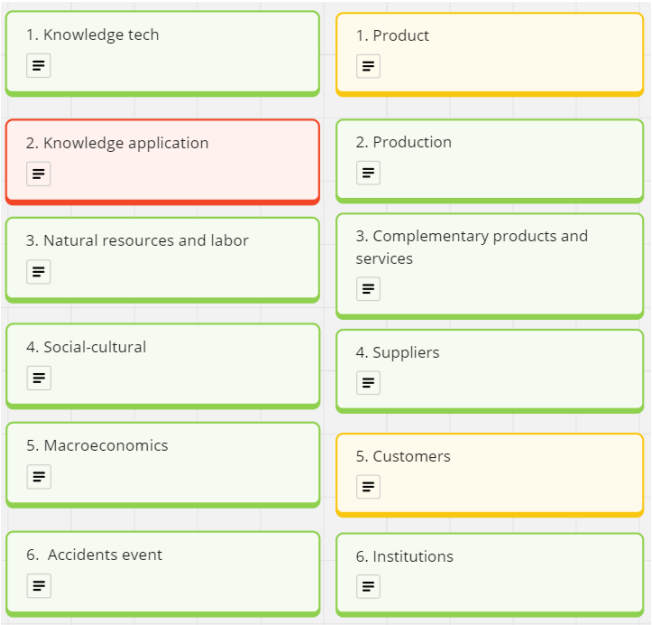

Figure 3.5: TIS factors for WD40.

As a consequence of the redesign, the business model had to change as well. These changes have been explained below (WD40, 2023) (PSC, 2017), (BENNA, 2015), (S. Williamson, 2022).

(a) Value Proposition: The formula was adapted to make it better for household applications. The product was adapted into aerosol form which made its application easier for consumers.

(b) Value Creation: The company improved the packaging and switched to an aerosol form which improved usability. The company after the redesign effectively entered into a new market. The new market meant that more customers had to be catered to. This led to

an increase in the number of manufacturing centres, which is accompanied by an increase in key partners and suppliers. Further as claimed on their website, the core team of the company had increased to 7. This means new key resources were hired.

(c) Value Delivery: As the market grew, WD 40 had to create partnerships with new distributors and retailers that enabled the product to reach more customers. The rise of E-commerce also acted as a new channel for the company to sell its products.

(d) Value Capture: The new market led to increased revenues which in return. Moreover, the company started issuing brand licenses that enabled other products to use their brand name and logo. This generated additional revenue for the company as it now expanded into complementary product categories (thoughtco, 2019).

The impact of niche strategy on the business model is visualised in Figure 3.8.

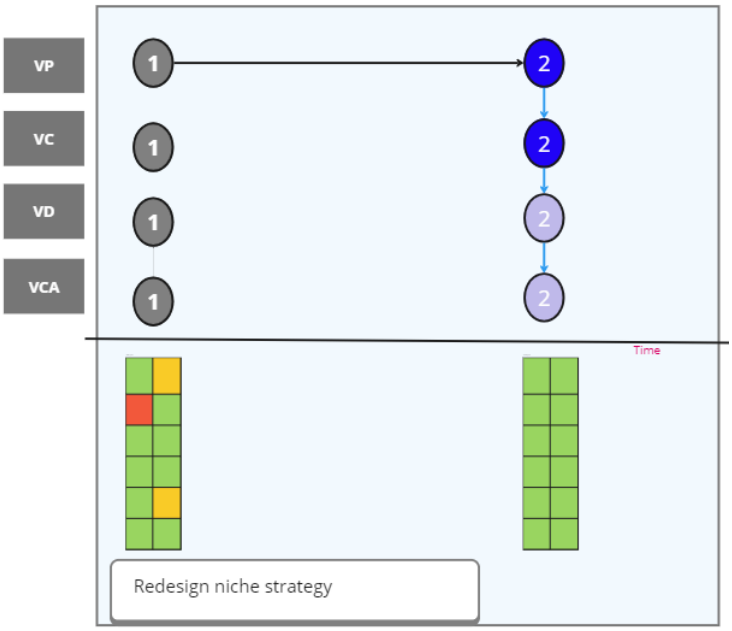

Figure 3.6: WD40 business model changes due to redesign niche strategy.

The story of Post-it notes

A researcher at 3M had created an adhesive that left no marks on the surface to which it was stuck. The objective of his research was to create new adhesives. Dr. Spencer Silver realised that this adhesive that he created had more applications because it left no trace behind on the surface. However, he still failed to find an appropriate use for this product, this was before 1986. Another scientist Art Fry, used to stick notes on his wall and would come back to see them fallen. He identified this as a problem that needed fixing. Art and Spencer thus began work to find a solution. They communicated by attaching little notes in the office and it finally struck them, that a possible application was to use these notes as a method of communication. The product primarily saw applications in offices. Later, however, 3M realised the potential for the notes to be used not just for communication but also for personal notes and even organisation. The initial version of the product, the no-residue adhesive found no market but after a redesign, it came to be a staple in every household or office space. Initially, there was a **lack of knowledge of application** which led to the lack of a suitable **product**. The adhesive saw various applications, however, it was still unknown as to know the adhesive could be put on the paper. This highlights that the **knowledge of technology** was also lacking. (Skillicorn, 2017),(Lavangar, 2016)(Mertes, 2023)(Nick Glass, 2013).

While 3M cannot be considered a start-up at that stage, the post-it notes can be considered as a product and the business model for it can be made. The actions taken by the two founders can

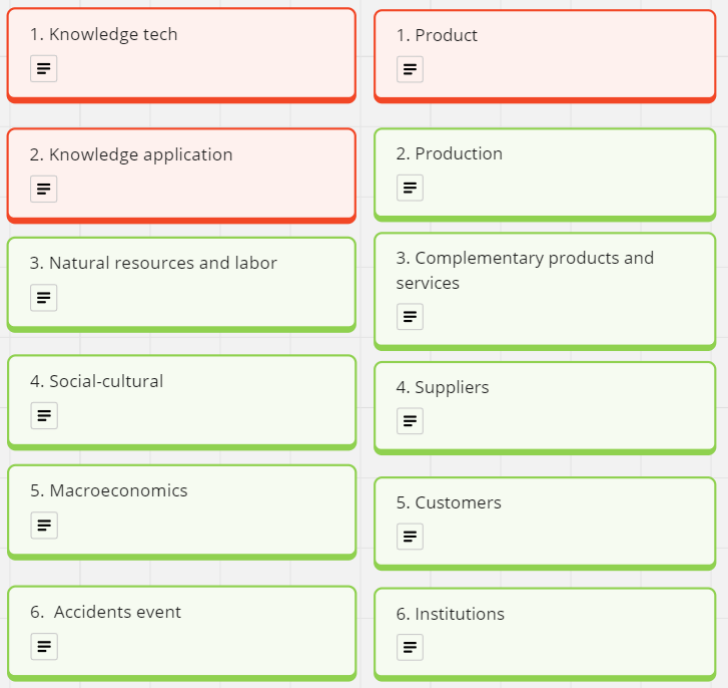

Figure 3.7: TIS factors for post-it notes.

be equated to a suitable component in the business model. The changes have been explained below:

(a) Value Proposition: Post-it notes started as an adhesive, then it was made into a reusable bulletin board which never made it into production. It finally evolved into the product that is loved today after years of research by scientists to get the glue to stick to the paper.

(b) Value Creation: The company undertook activities to get people to use. As said by the creators themselves, it was a product that no one needed, the company after a quick demo was faced with an overwhelming amount of re-orders forcing them to expand their manufacturing services and invest resources into the product.

(c) Value Delivery: The value delivery did not undergo major changes but rather expanded on the delivery network employed by the company. The product saw a rise in demand after it was demonstrated.

(d) Value Capture: The new product meant a new source of revenue for the company. The new product also led to new cost structures for the company given the increasing production. The process of the invention of the adhesive to finally finding a suitable application that found success lasted 10 years.

The impact of niche strategy on the business model is visualised in Figure 3.8.

Identified point of interest

Redesign niche strategy poses a unique problem in understanding the relation as its impacts are dependent upon the nature of the product. WhatsApp, for example, began as a status update service that later changed into a messaging service. Whatsapp (Cuofano, 2023) underwent changes to its business model in its VP and VC, however, the VD did not change. The VCA changed but can be neglected as ignored at the time being as it is due to company expansion. Whatsapp did undergo a redesign but the impact is different from the identified or proposed trend. This points to the inference that the proposed impact may be industry or market-specific.

The impact is observed in VP and VC. Further changes to VCA and VD are considered. In the case of redesign from theory, it may be due the improper knowledge of application, this may arise due to improper knowledge of technology and the lack of a product. The knowledge of application allows the company to identify the industry that suits their product the best, however, the lack of

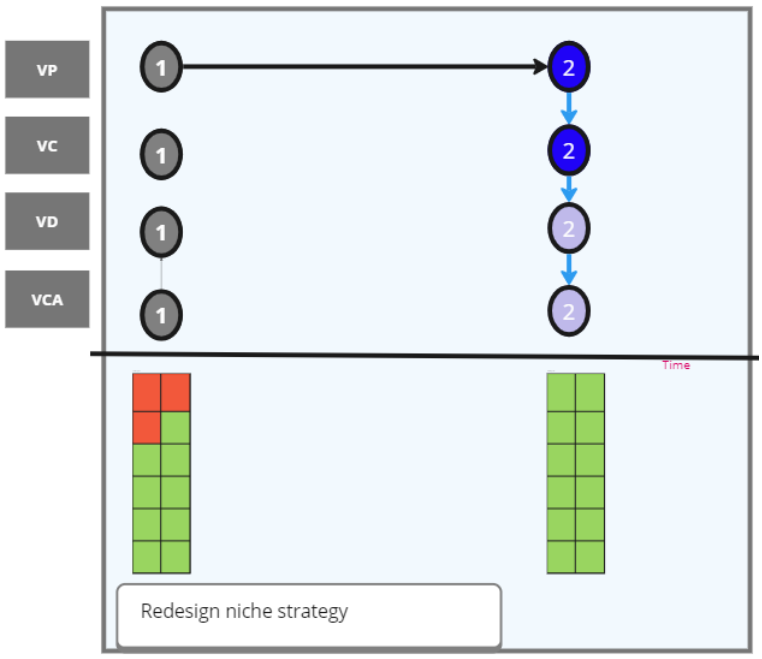

Figure 3.8: Post-it business model changes due to the implementation of redesign niche strategy.

knowledge of application may be associated with the lack of knowledge of technology. The lack of technical expertise can lead to the identification of an incorrect market as the potential market. Hence it is concluded that the knowledge of technology, application and product barriers may be impacted due to this niche strategy. A strong case can also be argued that customers may be impacted. A redesign would involve a VP change that might open a new market which was previously unseen. This is however just a hypothesis. The generalised impact can therefore be visualised as seen in Figure 3.9.

3. Stand-alone niche strategy

A standalone niche strategy is typically applied when there is a lack of complementary products and services. It involves the product being modified such that it would no longer require complementary products and services. To achieve this, the need for complimentary products and services has to be overcome. This would mean that the product need not undergo change but rather the external factors for this product need to be in favour. A new value that is currently missing(Complimentary services and products) needs to be created. This would entail a change in the value creation. Additionally, the introduction of new services or products may result in new cost and revenue models, which can be represented as a change in the value capture of a company.

Tesla: Supercharger network
The main drawback for electric vehicles is the shorter range, which requires frequent charging. Charging a car battery was a time-consuming process. Moreover, the charging infrastructure was sparsely available and took a long time(Sevilla, 2022)(PricewaterhouseCoopers, 2021),(Codibly, n.d.) (Illmann & Kluge, 2020). The company made electric cars which needed charging stations. A charging station can be considered to be a complimentary service that needs to exist for the diffusion of the product to be possible. There was a lack of **Complimentary products and services**, supercharger technology that made the process of charging quicker was lacking the **knowledge of technology**. The supercharger was a technology developed by Tesla specifically for Tesla products(Energy5, 2023). It is important to note that, electric vehicles are considered as the primary technology and charging infrastructure is considered the complimentary products and services. The same barriers however still apply as knowledge regarding the charging technol-

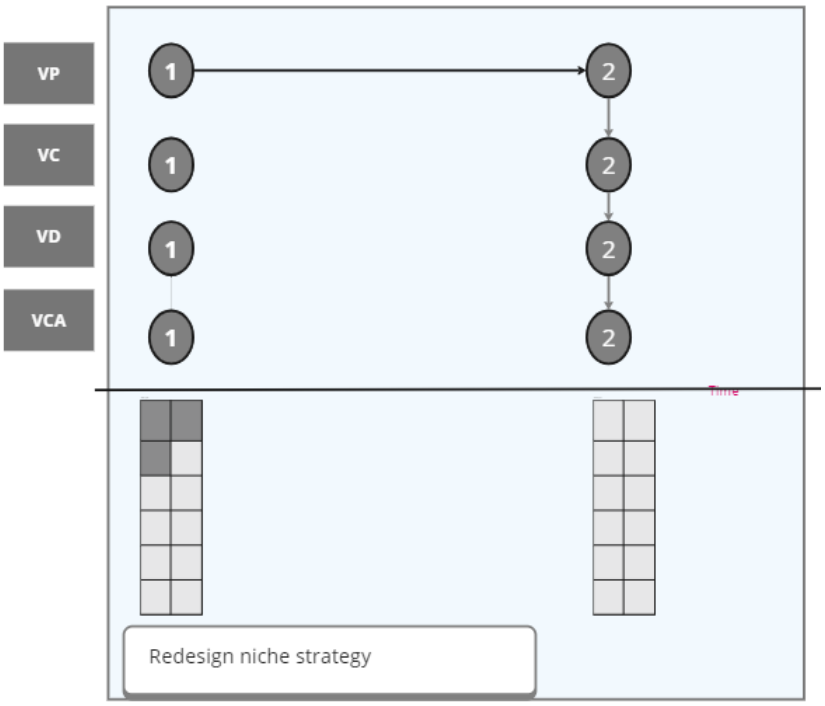

Figure 3.9: Proposed impact of redesign niche strategy on the business model.

ogy was insufficient. By creating its charging network, Tesla eliminated its dependence on other manufacturers to create and set up electric charging stations. Tesla supercharges also aided in creating an ecosystem. This meant that the user would drive a Tesla and charge with the same company as well. The business model was affected in the following ways:

(a) Value Creation: The supercharger network meant that Tesla had to collaborate more closely with the electricity department to ensure that supercharging is possible. Another change that aided Tesla is the competitive advantage it gained over its competitors by reducing charging time. As of February 2023, the US government is paying Tesla to expand and open more charging stations. Such a move not only aids Tesla but also other electric vehicle manufacturers(Nerozzi, 2023),(Mollica, 2023).

(b) Value Delivery: New supercharging stations were set up that act as an extension of the company itself.

(c) Value Capture: The charging stations were now a new source of revenue for the company. It eliminated the use of other charging stations and got more revenue into the company, this time a 'refuelling' station. Tesla set up supercharging stations which were more expensive than conventional charging stations. The higher prices meant more revenue, this also comes with the increased cost of operation for the supercharger station.

The main purpose of the stand-alone niche strategy is to reduce dependency on complimentary products and services which acted as a barrier to large-scale diffusion.

Figure 3.10: TIS factors for Tesla Superchargers.

The impact is visualised in Figure 3.11.

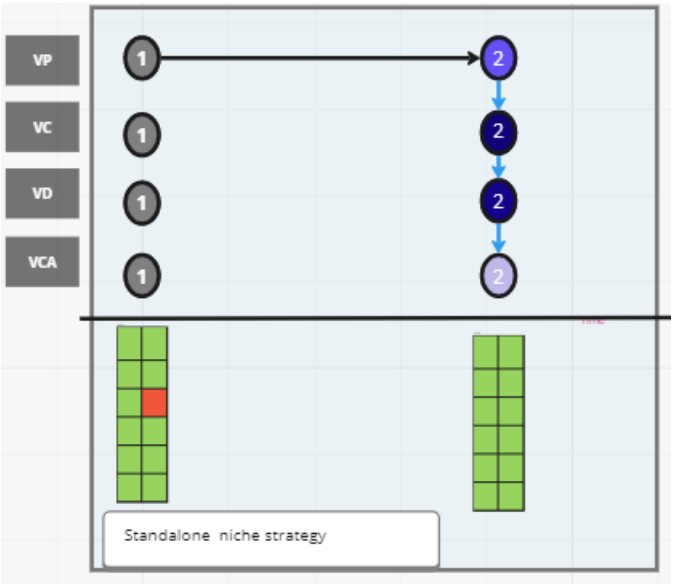

Figure 3.11: Tesla business model changes due to the implementation of standalone niche strategy.

Gopro Plus

GoPro was founded in 2002 by Nick Woodman who fancied doing adventure sports(Zippia, n.d.-b),(VOMT, 2016),(GoPro, 2023),(Cipriani, 2016),(Neculai, 2020). Gopro currently specialises in making actions cameras that rugged, durable and versatile. While there was no barrier to the large-scale diffusion directly. The company realised that there was a need for software services that complimented the products. GoPro started to gain popularity due to videos that were shot by mounting cameras to surfboards, bike helmets, and the outside of vehicles. The videos were inspiring and the videos made by current consumers served as advertisements that inspired more people to get creative. As per the admission of the company itself, the process of offloading camera footage, editing it and then publishing was a cumbersome process. The technology was

ready, saw applications and had customers. The only barrier the company experienced was the lack of **Complementary services and products**. The information from GoPro is obtained through an interview with the CEO of the company, the transcript of which can be found at (Tzuo, 2009). The company invested in developing complimentary products and services to make the

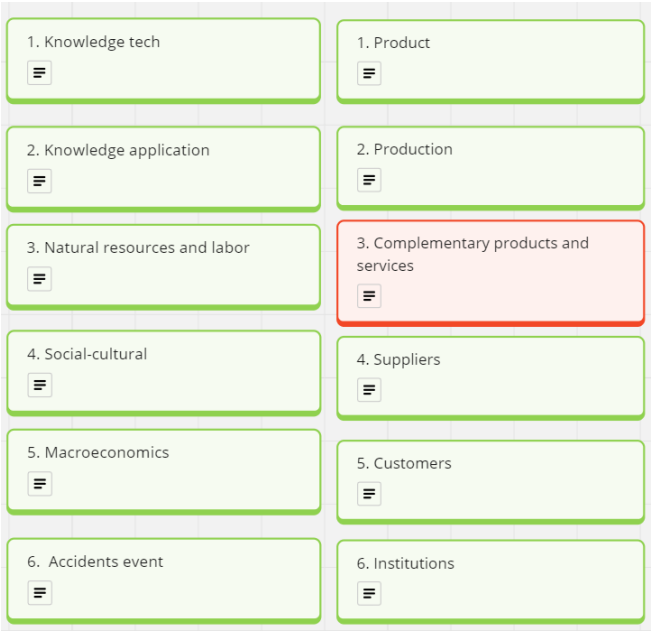

Figure 3.12: TIS factors for Gopro.

GoPro experience more seamless. GoPro developed its video editing and exporting software.

(a) Value Creation: Gopro acquired startups that were developing video editing tools. The startups were Stupefix and Vemory. They now acted as new key partners that enabled the use of video editing tools for Gopro Plus customers.

(b) Value Proposition: The value proposition of gopro itself did not change but rather the addition of gopro plus made it so that video editing was now possible with the addition of complementary services. In this case, the additions were made due to the addition of new key partners or the acquisition of new startups that offer these services. Hence the value proposition for gopro itself remains the same. A change in value proposition would be considered based on the perspective. If GoPro itself is assessed, the camera value proposition remains the same. However, if the company is considered in its entirety then, the value proposition is increased due to added services.

(c) Value Delivery: A new form of value delivery was made possible online through the addition of new photo/video editing services. This new software is provided with added value that is delivered online.

(d) Value Capture: Gopro Plus introduced a subscription model that acted as a new revenue stream for the company. Other changes include the incorporation of costs and revenue associated with the new products.

It is interesting to note that while applying the stand-alone niche strategy, the value proposition and value capture may or may not change depending on the product. (Dordick, 1990) highlights that telegraphs applied the standalone niche strategy which led to telegraphs being used directly from customer to customer. In this case, neither the value proposition nor the value capture changed, rather the value delivery changed.
Another such example is Warby Parker (Denning, 2016),(BMtool, n.d.), they were also an eye-wear provider with nothing new to offer, and the method of offering was new. They modified their supply chain and dealt directly with customers through e-commerce channels. The company had a revolutionary new business model for an eye-wear company(S. Joshi, 2020). The value capture

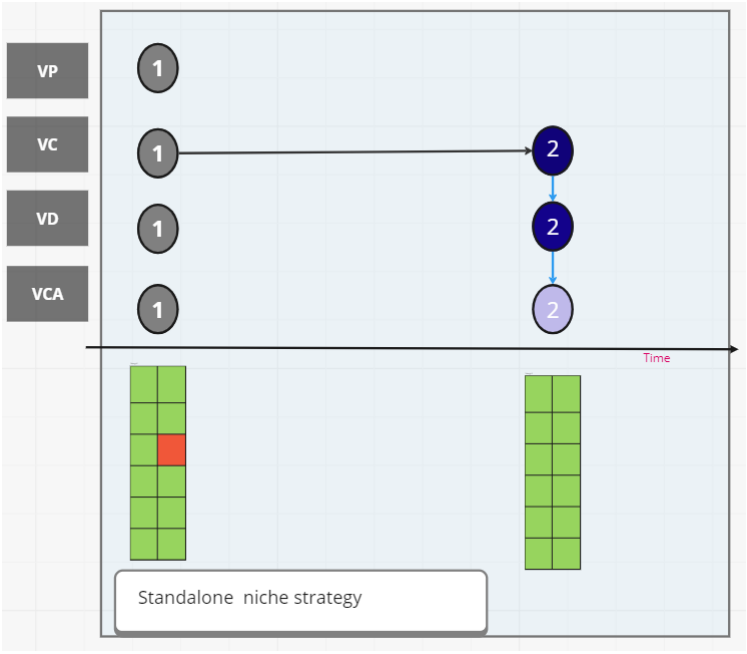

Figure 3.13: GoPro business model changes due to the implementation of standalone niche strategy

and value proposition remained the same, however, the novelty was seen in the Value delivery and value creation. This highlights a form of drawback that, the impact of this niche strategy on the business model depends on the product and nature of service provided by the company. Applying the understanding of the niche strategy along with findings from the two cases leads to believe that by employing the stand-alone niche strategy a change is made to the VC, VD and VCA. The impact of the niche strategy on the business model of go pro is visualised in Figure 3.13.

The proposed generalised impact of the niche strategy on the business model is visualised in Figure 3.14.

4. Hybridization niche strategy

The strategy may be best employed if there is a technological shift (as in the case of Prius, explained below), or if multiple systems exist. In such cases, more value may be derived from a modified system capable of meeting the needs of both current and new generations of consumers and technology. The most logical change that could occur would be to the value proposition. As it would have to be adapted to work either with other technologies or older versions. This represents a change in value proposition. Another logical conclusion that may be reached is the change in value creation. New resources are required to bridge this gap between the technologies and the products. The value delivery could also change due to an entirely new product that is created as a result of a hybridization niche strategy. Hybridization could potentially mean the mixing of different markets together and hence the channels need to be different. This would represent a change in the Value delivery. Finally, the value capture may change to account for the new resources needed to create this value. Furthermore, since the VP of the product underwent improvements. It would mean the VCA would also have to adapt to account for the added value.

The story of Hybrid vehicles with Toyota Prius.

The hybrid electric vehicle serves as an example. At a time when there was a lack of market for electric cars, but interest was observed to rise, cars like the Prius were launched, they are hybrid vehicles that were able to satisfy the demands of both kinds of consumers, the market was not ready to undergo a shift into electric vehicles, however, companies still saw it as the future and wanted to continue developing them. The way they saw fit to do so was to adapt

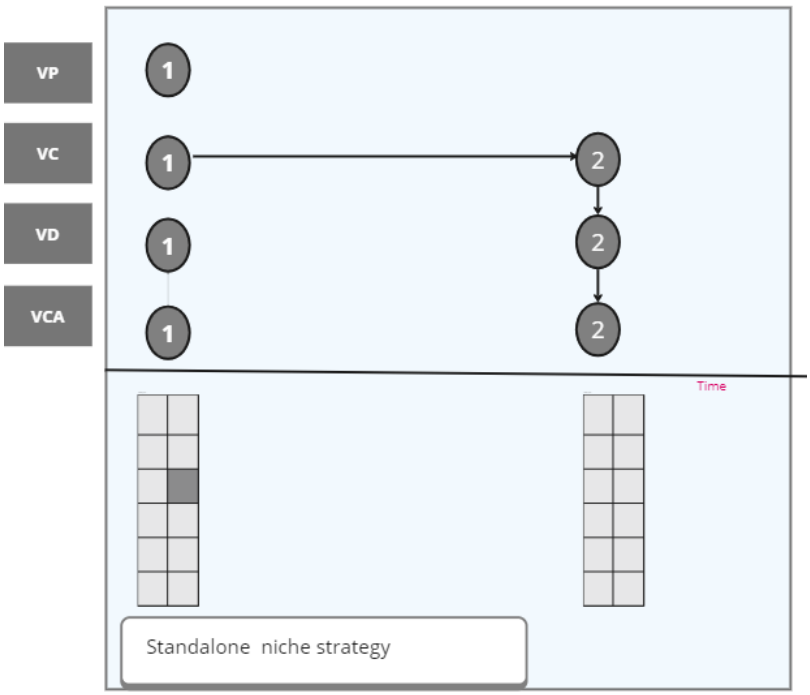

Figure 3.14: proposed impact of standalone niche strategy on the business model.

the electric vehicle to include the advantages of conventional automobile (Doll, 2008). At this point, electric vehicles were not ready for the market yet as the **knowledge of technology** was lacking, the **product price** of electric vehicles was expensive, and charging infrastructure was lacking leading to the barrier of **complementary products and services**. Customers also did not believe in the technology which meant the adoption rate was poor and **customers** was a barrier. Another reason for the customers a barrier was the high price. Consumer perception also posed a barrier as customers considered Electric cars sub-par. **The Product** was also not ready and needed further development.

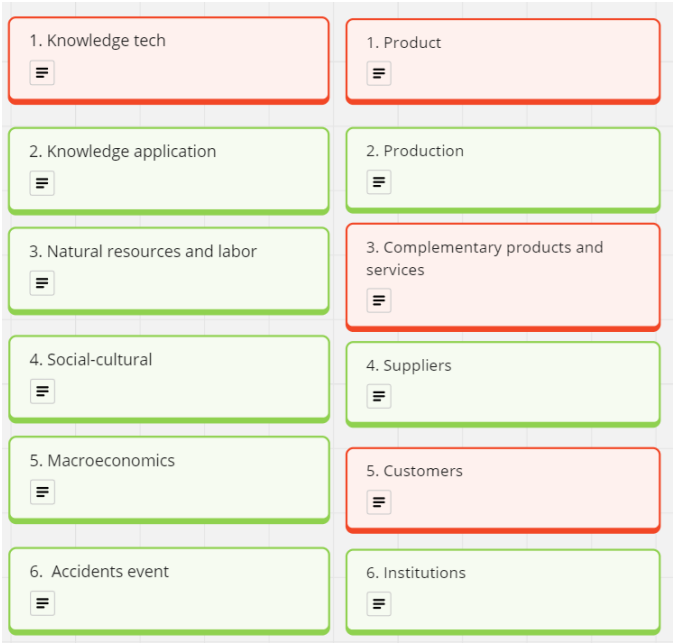

Figure 3.15: TIS for Prius.

The company proceeded to adopt a hybridisation niche strategy. The company incorporated a traditional petrol engine into the electric car, making it more reliable and addressing many of the concerns that the customers had about electric vehicles.

(a) Value Proposition: The vehicle was fitted with a conventional gasoline engine to address many of the concerns regarding electric vehicles. The combination of electric and gasoline improved the driveable range of the car and made it more reliable.

(b) Value Creation: The company had to align with new partners that enabled the use of gasoline engines in their electric vehicles. The partners were the gasoline division of toyota, since they used different technology however they can be considered to be different entities that created a joint venture out of which the Toyota Prius was born.

(c) Value Delivery: The prius took demo runs in many cities showing the capability of the vehicle. When Prius entered the UK market, they found that consumers were hesitant to purchase the vehicle and hence Toyota came with a private leasing scheme.

(d) Value Capture: The prius adopted a leasing model, due to which they had to alter their cost structure as in the UK market, leasing vehicles meant that the upfront revenue generated by the company is low.

The Toyota Prius was not just about hybrid vehicles; it was about improving the perception of electric vehicles by combining them with the traditional reliability of gasoline vehicles(Clifford, 2015),(Editors, 2021),(Furr & Snow, 2015c).

The impact on the business models is visualised in Figure 3.16. It is interesting to note that Value capture is an outlier change as in, the new revenue model was not triggered due to the application of the niche strategy alone but rather due to business model innovation.

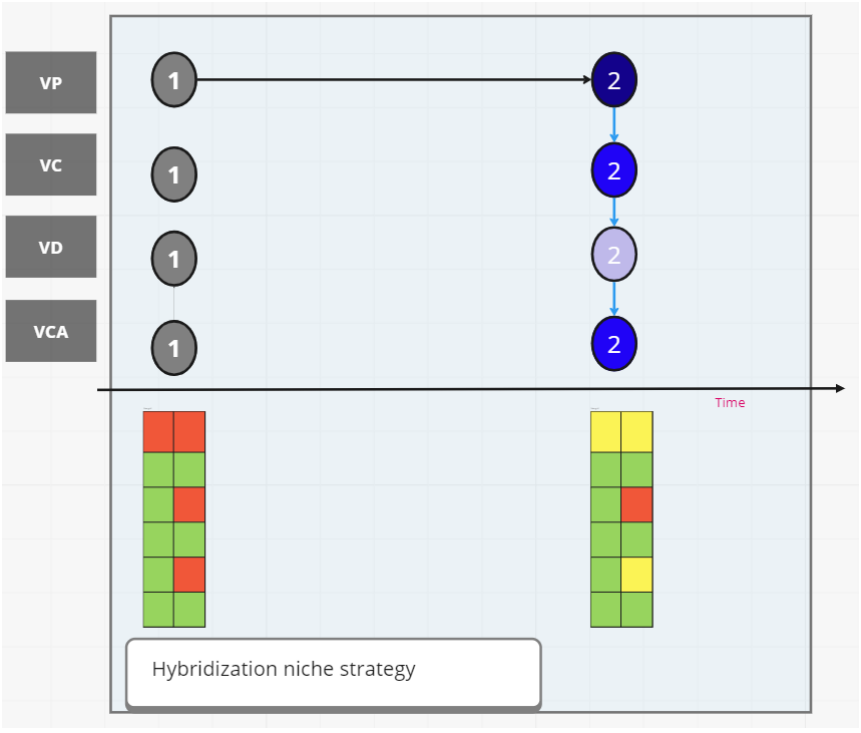

Figure 3.16: Prius business model changes due to implementation of hybridization niche strategy

The story of Amazon Echo or Alexa

Smart house products were becoming the norm due to the rise in the concept of the Internet of Things(IOT). Amazon around this time developed a virtual assistant called Alexa, the applications of Alexa were limited as most voice assistants operated on phones, however, Amazon did not sell

any phones. Amazon incorporated the voice assistant with a Bluetooth speaker to begin with and added further functionality. The added functionality allowed the Amazing Echo speaker to control various smart appliances in the house. The existing barriers for the voice assistant at the time prior to echo was that the **knowledge of application** was lacking, and the technology was understood however there was no **product** to sell or use.(Nast, 2021)(KIM, 2016),(Dawar, 2015) (Ramadan, 2021). The company modified the following to ensure the diffusion of the technology:

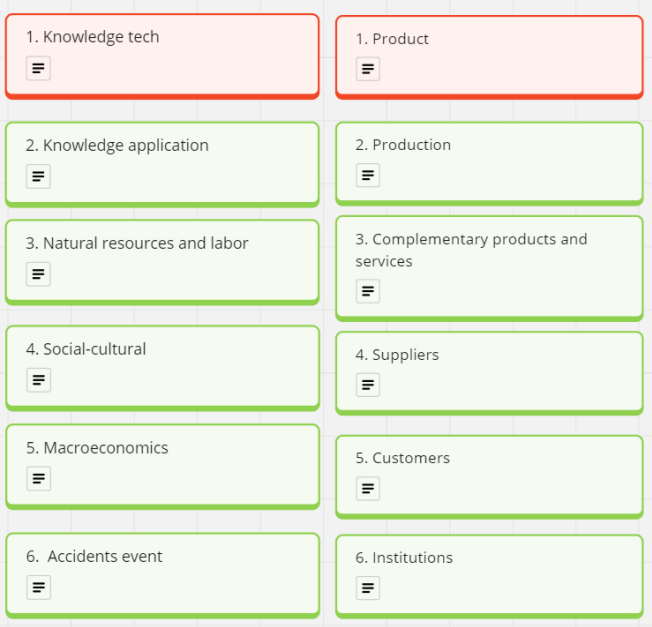

Figure 3.17: TIS factors For Alexa

(a) Value Proposition: The value proposition of Alexa increased as the compatibility with smart appliances around the house increased. These interconnections added to the existing value of Alexa by now allowing it to control appliances around the house. The customer could simply shout out a voice command for an action to be done and it would be done by the voice assistant.

(b) Value Creation: The value creation saw changes due to increased functionality. This also led to the hiring of more developers that could find applications for the voice assistant. The voice assistant saw its seamless integration into various products and services which added more features to the voice assistant itself.

(c) Value Delivery: The value delivery did not experience major changes given that Amazon had well-established distribution channels. However, the value delivery improved as the product improved, and the added features provided new methods for value to be extracted from smart appliances around the house. An example of such was that Alexa could be given a command in one part of the house to turn on or off an appliance in the other corner of the house. While this did not require changes to the value delivery of echo directly. It led to the value delivery methods for other appliances being modified.

The development of Alexa is still ongoing as the field of artificial intelligence grows. As stated by the Senior VP of Devices and services, David Limp. The idea is to incorporate AI to make Alexa ”a great assistant”.

Considering the examples and the interpreted definition of the stand alone niche strategy. It may be concluded that the standalone niche strategy has an impact on the VC, VD and VCA of a company. The business model changes and the TIS factors are seen in Figure 3.18.

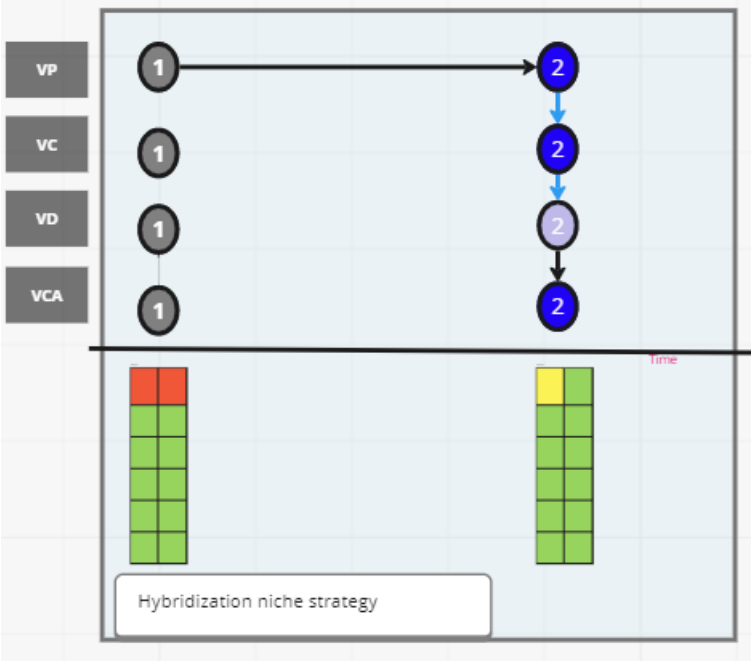

Figure 3.18: Alexa business model changes due to implementation of hybridization niche strategy

The proposed impact of the hybridization niche strategy is seen in Figure 3.19.

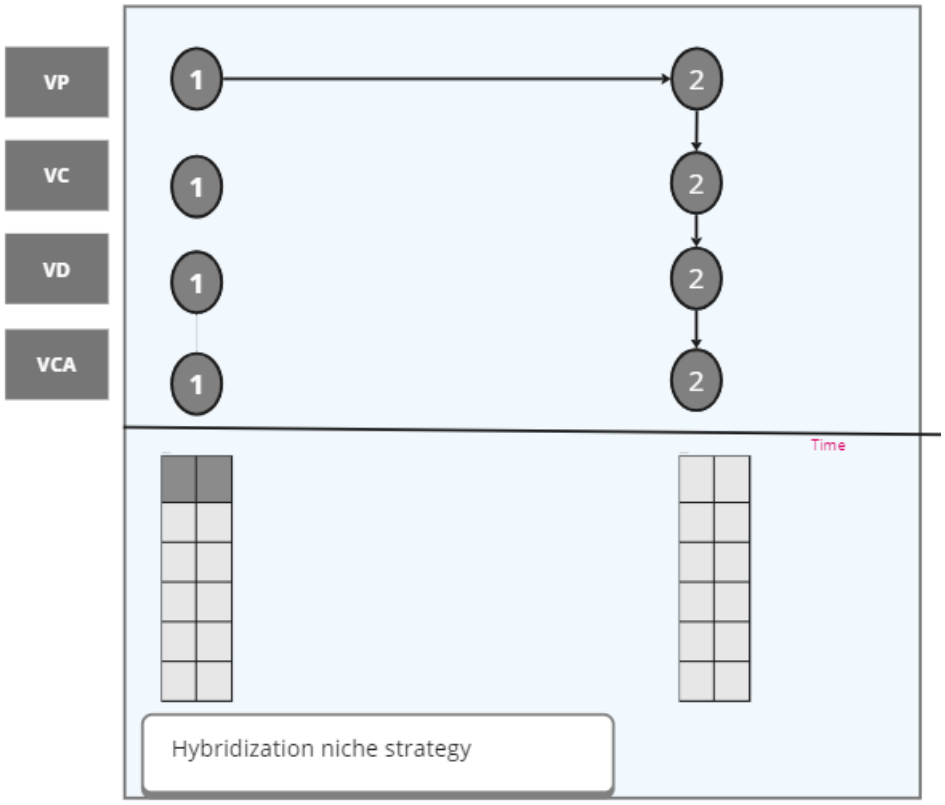

Figure 3.19: proposed impact of the hybridization niche strategy on the business model.

5. Top niche strategy
   The top niche strategy is employed to sell the product exclusively to specific consumers, aiming

to maximize profit margins. However, to target this unique top niche, the value proposition has to be updated. Following this, other changes in the business model must align with the company's goals. The higher profit margins allow the company to increase R&D spending, which would in turn develop the value proposition of the product. The additional money would ideally be used for company expansion purposes that would create new resources that aid in value creation. Further, the market being targeted is the top niche and hence the channels may need to be adapted representing a change in the value delivery. Finally, given the large profit margin that exists, this may aid the company in the development components that require development.

The story of Tesla

The story of Tesla Roadster is a good example of the top niche strategy. The Tesla Roadster was the first car produced by the company. The car was very expensive when compared to conventional vehicles and this was done for a reason. Tesla was a small struggling company that still required funds to continue development of its electric vehicles depicting a lack of **Knowledge of technology** and the lack of readiness of the **product**. A commercial method of production was also not yet established hence the **Production** was a barrier. The TIS factors have been visualised in Figure 3.20 The Tesla Roadster was aimed at consumers who had high purchasing powers and understood that technology was not fully developed. Tesla used this small market that it had catered to as beta users of the vehicle. The high price meant that it was not affordable for the common consumer. Moreover, at that time, there was no support from the government in terms of tax exemptions or even subsidies. The beta customers acted as test subjects that provided feedback and aided in the further development(Reed, n.d.),(PEREIRA, n.d.)(Furrier, n.d.)(Wu, n.d.). Further Tesla has claimed to use the top niche strategy in a blog post written by Elon Musk, the CEO of Tesla (Musk, 2006) to overcome these barriers. Based on the actions taken by the company, suitable changes are made to the business models. The affected components are VP, VC, VD and VCA. The changes to each component are explained below.

(a) Value Proposition: the top niche the product was made exclusive. Moreover, constant R&D ensured that the value proposition kept developing. As the technology progressed, Tesla also launched various models. Each of these models had a different target market.

(b) Value Creation: The company has to partner with new investors, stakeholders and partners to make the diffusion possible. They also had to develop the knowledge of the charging infrastructure which was poor at this time. While the charging infrastructure was not entirely their responsibility, they realized it was a major barrier. They set up their own charging centers in order to overcome this problem which led to changes in the business model. Lotus was a major key partner as the Tesla roadster was based on the designs of the Lotus Elise, this has also been confirmed via a block post written by Darryl Siry, the president of sales marketing and services(Siry, 2008).

(c) Value Delivery: New channels and methods to reach customers. Tesla sold to customers directly via their website. The product was demonstrated in exhibitions and auto shows where customers could place orders for the product.

(d) Value Capture: Cost and revenue models were adapted to in the top niche strategy. As stated in Musk's post, most of the earnings from the product sales were directed to research and development of the vehicles. The manufacturing of the car itself was also undertaken by Lotus and not by Tesla themselves which changed the partnership between the companies. It not only provided intellectual property by also was a manufacturer of Tesla. Tesla had to pay a Lotus for this service. Moreover, Tesla was looking to invest in their own production line based on a post written by Tesla Co-founder Martin Eberhard(Eberhard, 2006). Hence the revenue and cost model were optimized with the objective of maximizing investment in Research and development followed by expansion of key resources

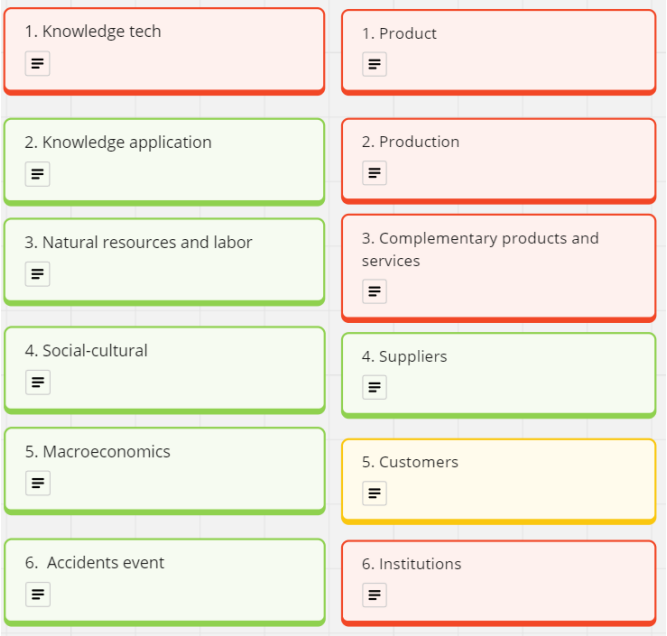

Figure 3.20: TIS factors for Tesla.

The impact of the niche strategy on the four components has been visualised in Figure 3.21.

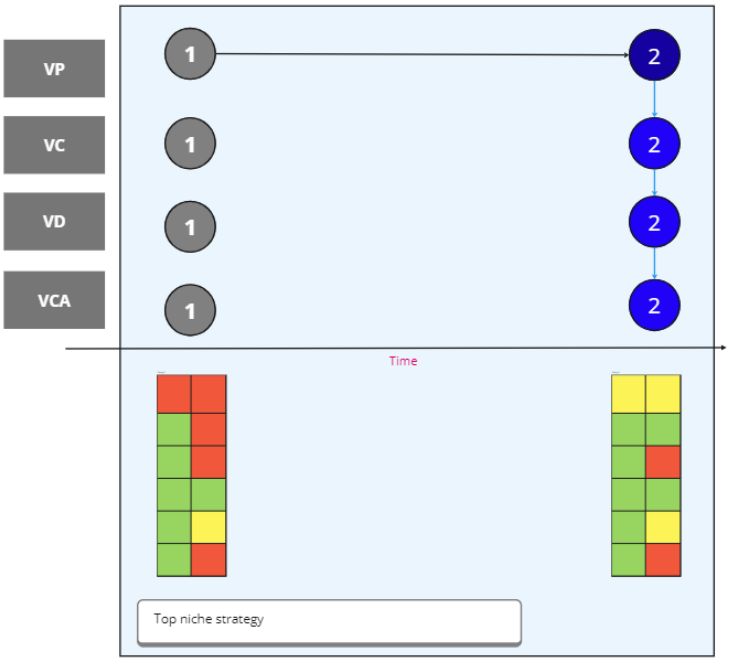

Figure 3.21: Business model dynamics of Tesla(I)

The story of FitBit

FitBit was founded in early 2007 by James Park and Eric Friedman, they identified a use for small sensors in wearables which made them 'Smart'. The company presented the idea for the product in a tech conference and received a whopping 2000 orders which is a lot considering the fact that the company did not have a product yet. This meant that **Knowledge of technology** was lacking, **production system was lacking**, **Product** also served as a barrier as it was not ready or did not exist. **Customers** did not act as a barrier but were limited due to the production capabilities at

that time. The product, production system and knowledge of the technology itself were poor, so to get started, they accepted 5,000 orders which were sold at high prices as quoted by Park himself the profit margin on these 5,000 units was ”pretty darn good”. Before they could sell the product, the founders spent months in Asia choosing the ideal suppliers and setting up production lines. The impact on the 4 elements of the business model is explained below(Marshall, n.d.),(Zippia, n.d.-a),(Bora, n.d.),(Feibus, n.d.):

(a) Value Proposition: The company invested their revenue back into research and development to improve the capabilities of the watch. The company added more products to its product line with upgraded features that included Bluetooth 4.0, an altimeter, stopwatch.

(b) Value Creation: The company had to partner up with new suppliers, and stakeholders that made manufacturing possible. New partners enabled the production line to commence and new stakeholders or investors provided the company with capital that enabled it to function.

(c) Value Capture: The first units sold were sold at high-profit margins to bring in revenue that made the company function. As the technology developed, Fitbit moved from high-price-small volume to low-price-higher volumes. Fitbits are now sold in thousands of retail outlets worldwide.

(d) Value Delivery: As the company saw a rise in quantities demanded, they partnered up with more retail stores making it possible for the company to reach a wider audience. This in turn brought in more revenue for the company which allowed the company to later reduce its prices to make it affordable and achieve large-scale diffusion.

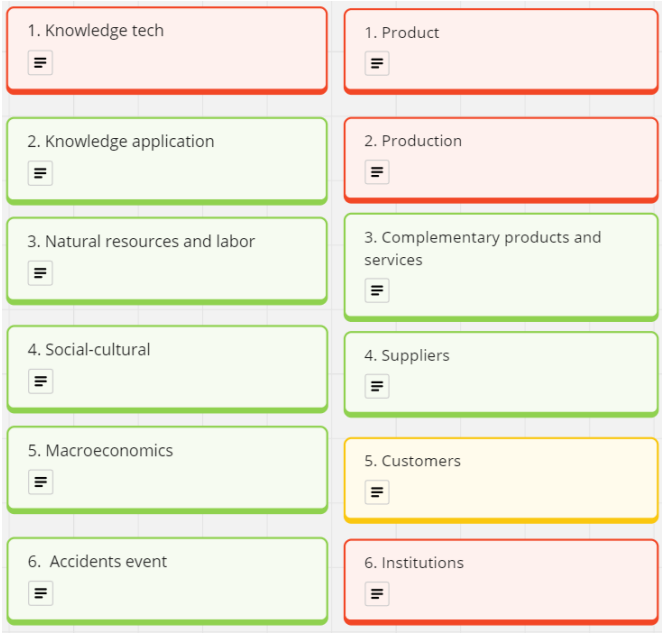

Figure 3.22: TIS factors for Fitbit

Based on the illustrated cases and the obtained understanding of the top niche strategy, it may be concluded that the impact of the top niche strategy would be visible on the VP, VC, VD and VCA. The impact of the niche strategy on the business model of Fitbit is visualised in Figure 3.23 The proposed impact of the niche strategy can hence be visualised as seen in Figure 3.24. The impacted components have all been represented in light grey.

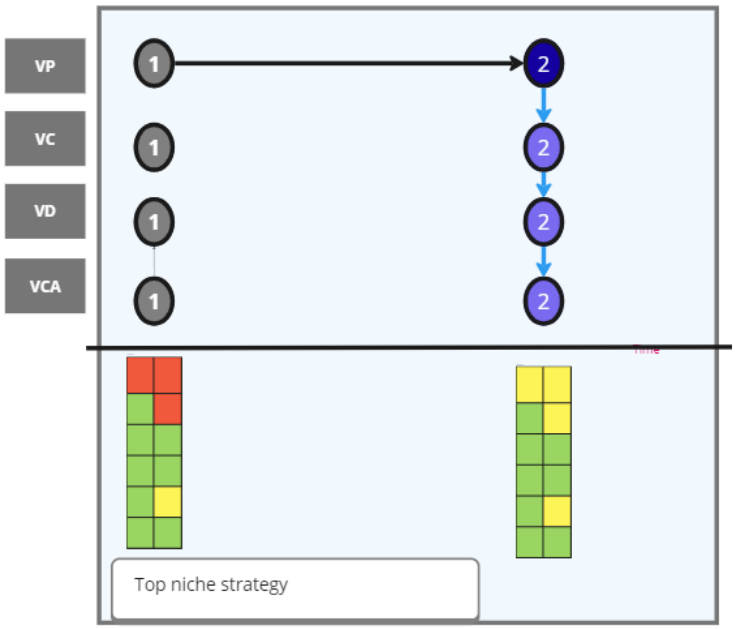

Figure 3.23: Business model dynamics of Fitbit

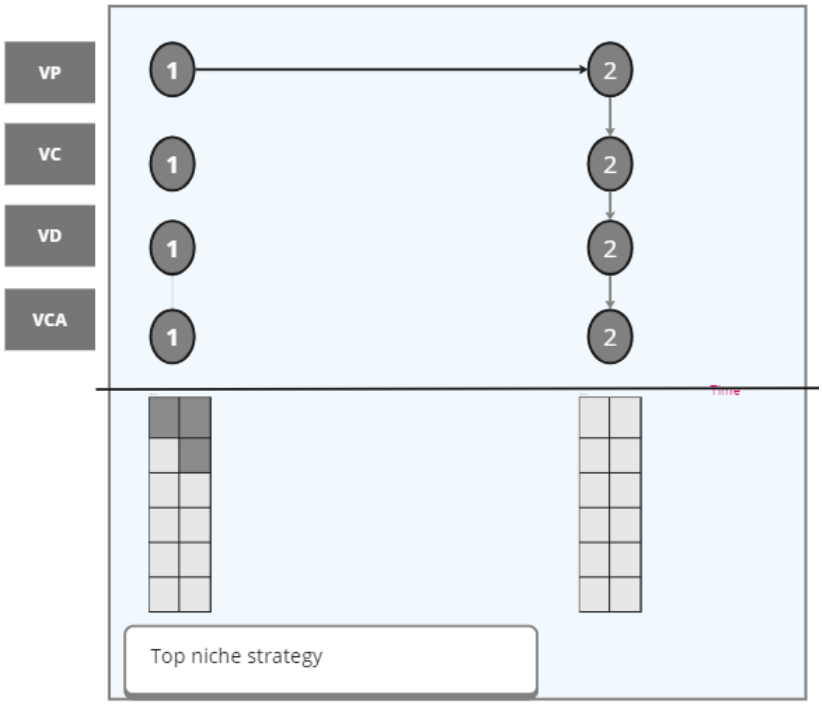

Figure 3.24: proposed impact seen due to the implementation of Top niche strategy.

6. Educate niche strategy
   The educate niche strategy is employed by MNCs in a very interesting method as highlighted in Lee et al., 2014. The idea is that by employing knowledge transfer, companies can reduce their cost, through the emergence of new suppliers willing to produce for the company or the development of technology itself which contributes to the technology achieving legitimacy in the market. Educating the target market always has shown to have a positive impact on the company (Eisingerich & Bell, 2008). Based on this information, may be understood to impact the value creation

and value delivery. The value creation is changed as the company is actively sharing its findings or is actively helping develop the knowledge regarding the technology. Finally, the change in VC can impact the VCA as in the educate niche strategy, The sharing of knowledge may impact the competitive advantage that exists in the market. Hence, it may be concluded that the niche strategy impacts the VD, VD and VCA of a company

The story of IBM
IBM made computers from 1950s(IBM, 2023b),(Anand, 2021),(Cortada, 2021). The technology was novel. This meant that **knowledge of the technology** was not sufficient for both the maker and the customer(IESE, n.d.). IBM's computers were novel and people needed training to use them, computers had untapped potential, but to unlock this individuals needed to be equipped with the skills to use them. The lack of knowledge meant that **customers** were not purchasing a computer. Moreover, early-day computers could be very expensive and also very huge. Computers in their initial stages were said to cost around 9 million USD and required a quarter acre of space and a crew of 30 people with instructions. IBM in 1981 launched the first personal computer. The barriers experienced before the launch of the first computer were the lack of **knowledge of technology** and lack of **a product and production system**. **Customers** needed to be educated regarding the use of the computers,**suppliers** were also lacking as they also did not possess the knowledge to make or use this new computer.

To overcome these barriers IBM employed the educate niche strategy. The company created programs for interested consumers to follow and thereby understand the workings of the computer. IBM had various educational programs namely, IBM Skills Build: It offers courses in areas of computers that are still active and helps create individuals with the skills needed for using emerging technologies(IBM, 2023a). IBM Digital-Nation Africa: Provides free digital skills training to African youth. This provides knowledge to the under served while at the same time also increasing adoption rates in these areas.

IBM changed their business model in the following ways :

(a) Value Proposition: IBM changed its business model in 1981 after the introduction of the personal computer. They introduced the open architecture program which made all their technological developments public. This allowed third parties to work on and develop the technology further. The value proposition of IBM computers constantly evolved as third parties were encouraged to make apps and create software for IBM computers.

(b) Value Creation: Third parties were allowed to work with the technology, this led to new partnerships and increased functionality as the technology progressed with the help of Research and development within and outside the company. The company made its intellectual property. As of July 2007, the company stated that it would enable access to its entire portfolio of intellectual property which amounts to 40,000 patents(Gridlogic, 2009).

(c) Value Delivery: The company believed in giving freedom to users to create new applications and software that improved computer functionality. IBM leveraged its brand name to create new partnerships and established authorised dealers and retailers that aided in the diffusion of the personal computer.

The impact of the niche strategy is visualised in Figure 3.26.

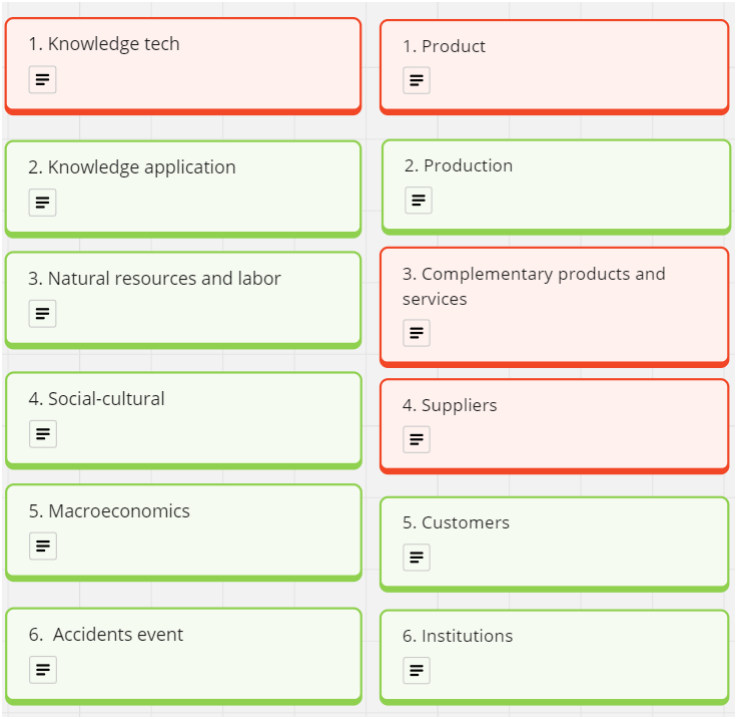

Figure 3.25: TIS factors for IBM

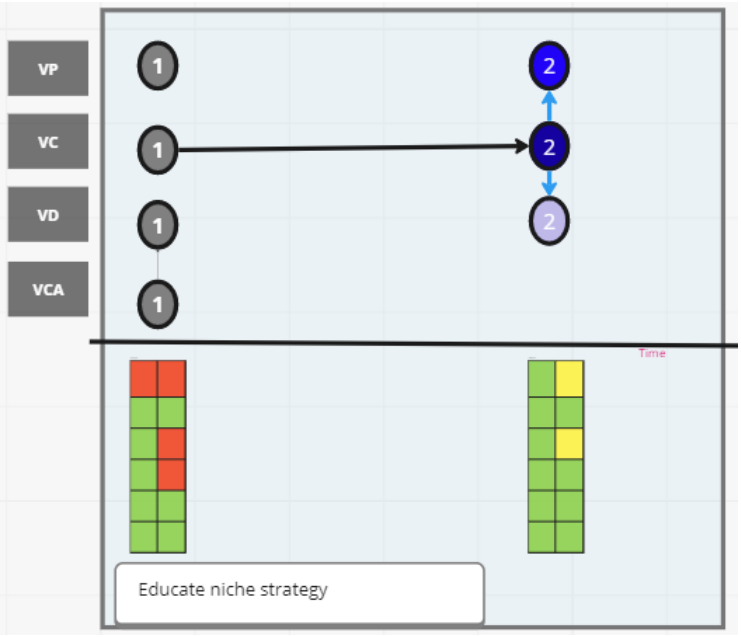

Figure 3.26: IBM business model changes due to implementation of Educate niche strategy.

The story of Arduinos

Arduino is an open-source electronics platform that started as a thesis with 5 researchers working on it. They developed the first Arduino board that could be programmed for various tasks. The main barrier was the lack of **knowledge of applications**, **lack of knowledge of technology**, both of these factors led to **customers** also being a barrier. The Arduino was made, however, there was no '**product**'.(John, 2014),(Barragán, 2023),(TEAM, 2021). It first saw application as an interactive design tool but was capable of a lot more. The creators of Arduino worked on it for 5 years and on the verge of bankruptcy decided to make the product an open source product.

This meant that all information was now made public. To find the right use, an experiment was conducted in which 300 blank printed boards were given out to students and they had to build projects based on all the information Arduino had made available to the public. The project was interesting because it led to a wide range of applications. The various applications also caught the eye of many new potential customers. The business model, so to speak, underwent the following changes:

(a) Value Proposition: The board was provided with as many pins and connectors as possible for maximum freedom while using or customization of the product. Other manufacturers of similar products at this time proceeded to reduce the number of pins, whereas Arduino wanted to give their users the freedom to customise it however they would like.

(b) Value Creation: Arduino set up education programs that allowed teachers and students to integrate Arduino into their classrooms for interactive learning. They also host workshops and fairs to spread knowledge regarding Arduinos.

(c) Value Delivery: Arduino set up project hubs to reach consumers directly and provide them with a platform on which customers can showcase their projects and take inspiration from each other. The project hub also allows users to explore and discover new possibilities with Arduino through discussion forums.

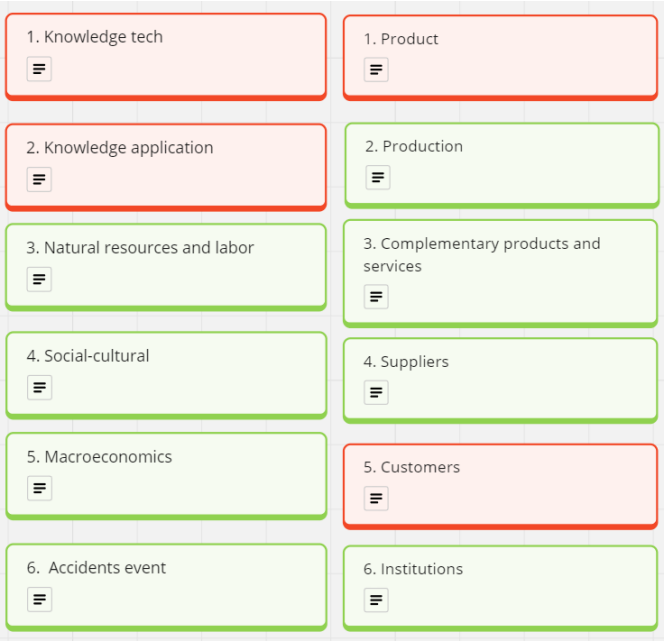

Figure 3.27: TIS factors for Arduino

Applying the definition of the niche strategy and the learning from the past cases, it maybe concluded that if the educate niche strategy is employed, it would imply a change in the VC,VD and VCA. The impact of the niche strategies on the business model is visualised in Figure 3.28.

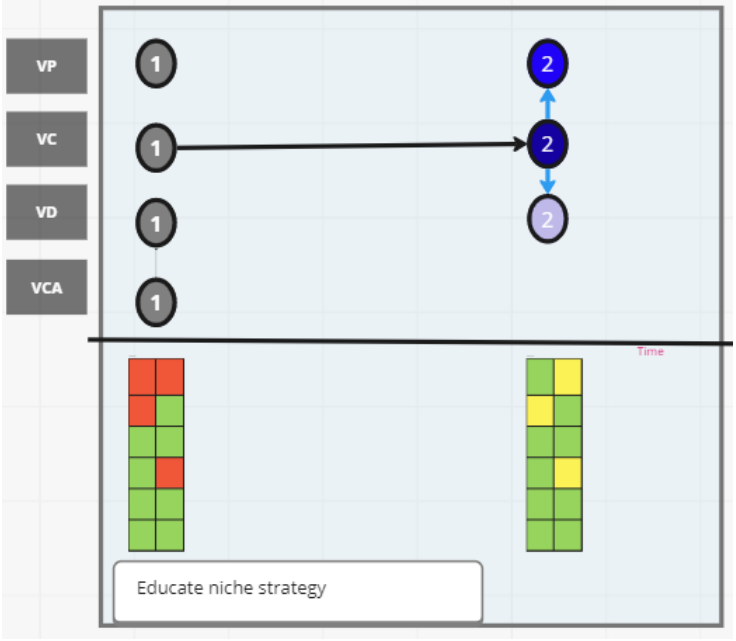

Figure 3.28: Arduino business model changes due to implementation of educate niche strategy

The proposed impact can be visualised as seen in Figure 3.29.

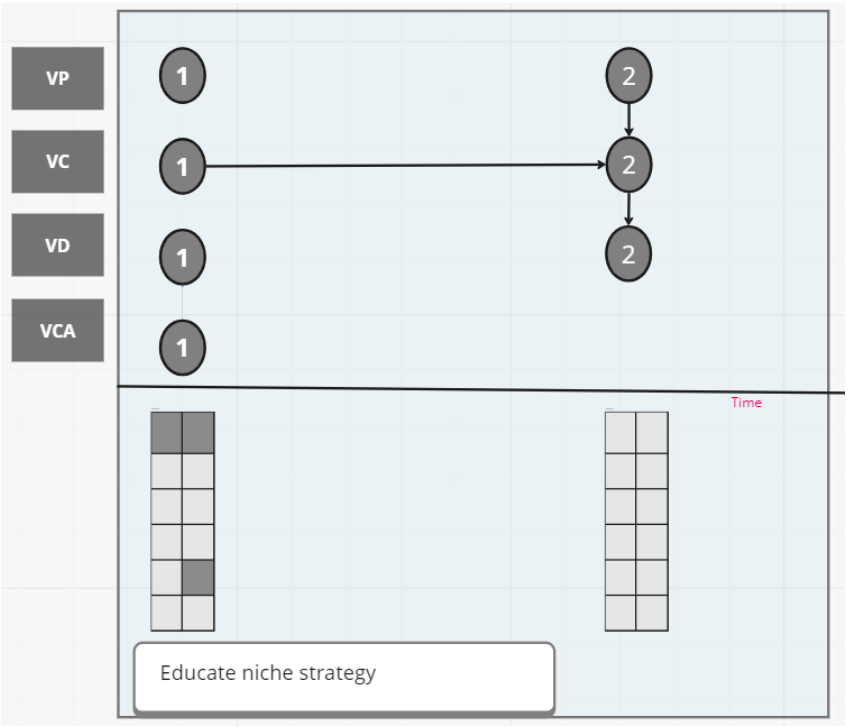

Figure 3.29: proposed impact of the implementation of educate niche strategy on the business model.

7. Lead user niche strategy
   The lead user concept has been prominent and has seen plenty of application (Trott et al., 2013). The research provides multiple examples of products that made use of the lead user niche strategy. The idea is by using the product themselves, the companies gain better knowledge of the needs of the consumer and the development of the project becomes more focused on developing

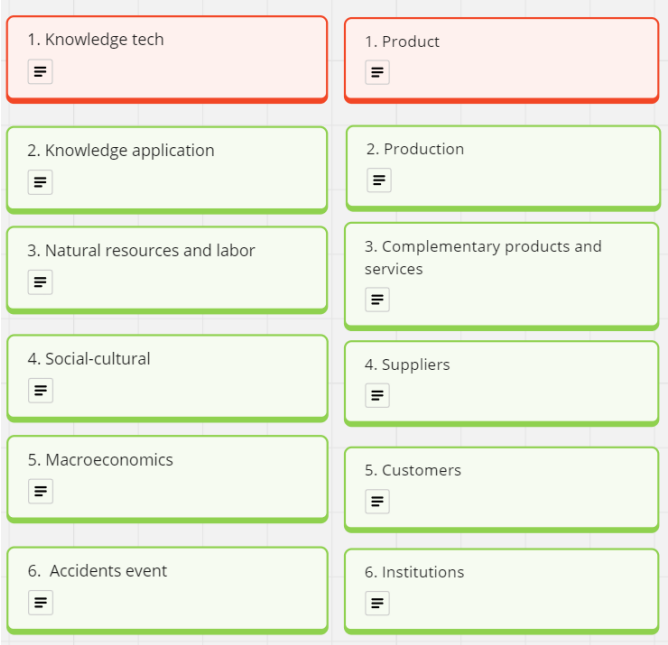

Figure 3.30: TIS factors for streetscooter.

features that would benefit the customer directly. The company is able to understand these needs as they are the users themselves. Some examples of such technologies are kite surfing products, semiconductors, and printed CAD software. It seems logical to make a few associations based on the definition and past cases. The value proposition undergoes changes as the feedback of the lead user is taken into account and the value proposition is modified. Value creation is changed as the lead user would represent a new key partner. In this case, the customer. Finally, the value delivery also experiences a change due to setting up new channels through which the lead user would interact with the company. It would also change as the company no longer caters to a market but rather to a specific customer.

The story of StreetScooter

The concept of StreetScooter was simple, it was to make an electric vehicle that had a production cost of 5,000 euros or less and the overall cost of the car was to be below 10,000 euros. The company failed to create a concept that met these requirements. The first barrier was the **Product** as electric vehicles were still an expensive affair. Reports have also suggested that the car was 'Low tech' and even lacked basic features such as heating. The company was working on electric vehicles but failed to produce anything substantial until DHL partnered up with Streetscooter and requested that the company make 10,000 scooters. DHL was the sole customer for the startup based at Aachen University. The lead user had very specific requirements for the car which other automakers refused to meet. Only the startup was willing to develop and create a vehicle as per their requirements. **Knowledge of technology** was also a barrier. One of the founders mentioned in an interview that they faced problems with the battery and the drivetrain. Other factors did not prove to be major barriers.(Lambert, 2018),(jutta, 2023),(Amelang, 2020).

The business model had to change and the changes in each component are explained below:

(a) Value Proposition: The company initially wanted to make a cheap and affordable EV, however, due to the deal with DHL, the company had to change the value proposition of the vehicle to better suit the requirements of DHL. StreetScooter developed the 'Work' model for DHL mainly to deliver letters.

(b) Value Creation: The company hired 100 new engineers to help realise their technology. These engineers were experts in their field and included delivery agents in this process to create a personalised vehicle for DHL.

The impact on the business model is visualised in Figure 3.31.

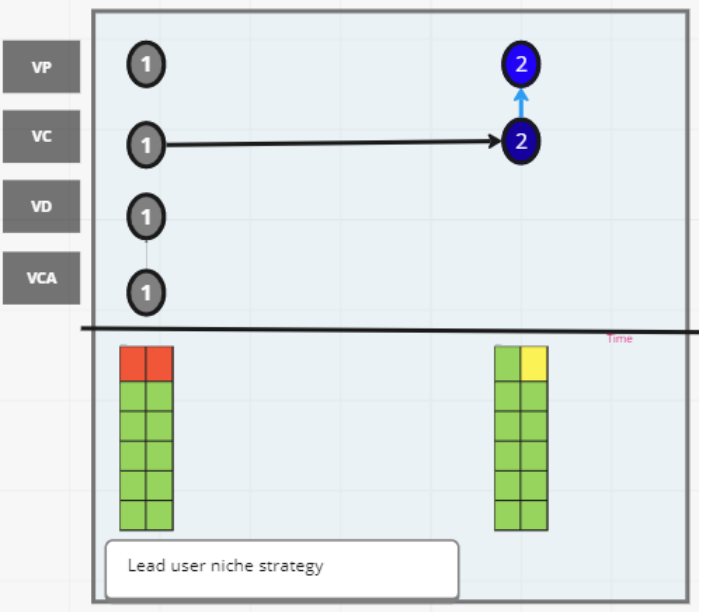

Figure 3.31: Streetscooter change in business model due to implementation of lead user niche strategy

The story of Dual Clutch transmission

The principle of Dual clutch transmission was invented in 1935. Porsche picked up and started further development in 1970. From the period of 1983 to 1987, the DCT was implemented in race cars. A case can be made that the lead user of the DCT was the racing division of the team or the company itself. Audi and Porsche used the dual-clutch transmission systems (R. Ortt & Kamp, 2022),(NEDELEA, 2017). The objective of a racing team is to win, meaning that the design requirements are very high. This would imply that while Porsche had a dual-clutch transmission system, for it to be used in race cars, it had to meet expectations set by racing teams. The TIS framework has already been applied to the Dual clutch transmission system. During the phase when DCT was used in race, few issues were identified. This meant that the product was not ready for the mass market. This connection is made as the racing teams act as lead users for novel technology. The KERS system is another example of racing teams pioneering a technology (M. C. Joshi et al., n.d.). The DCT technology saw use and minor developments during its application in racing. However, there was a realization that DCT was not as effective as sequential gearboxes, which were much better. The DCT was then shelved and saw commercial application again with its introduction by Volkswagen in their automobiles in 2003. This was made possible as the lack of **knowledge of technology** had been overcome, with developments in computer and material technology, the reliability of the **product** was also improved much later than what was expected unfortunately. Finally, the new market served as a suitable application thereby overcoming **knowledge of application**(SILVESTRO, 2019). For race teams to be able to use dual-clutch transmission systems they had to adapt their specifications to those demanded by the lead user, in this case it was the company itself. The changes to the business model were made in the following components:

(a) Value Proposition: The reliability had to undergo improvement. This was done to the best that was possible in 1987.

(b) Value Creation: To test and further develop the product DCT was used in race cars who further developed these systems.

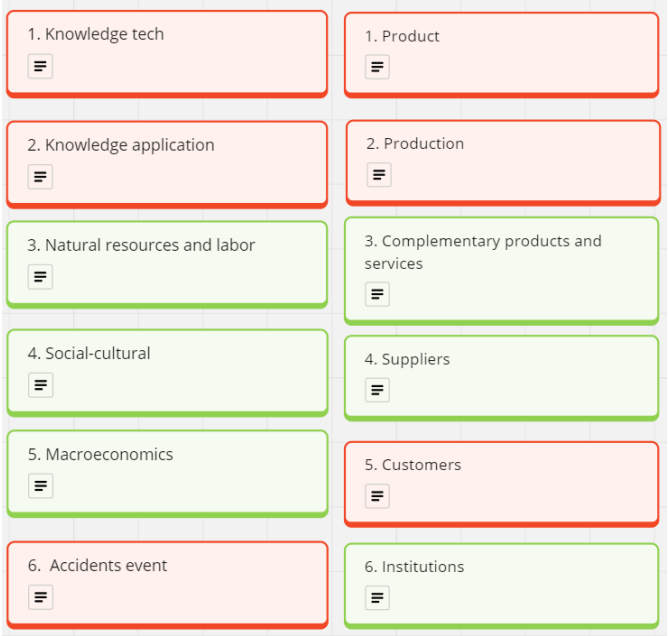

Figure 3.32: TIS factors for DCT.

The impact on the business model is visualised in Figure 3.33.

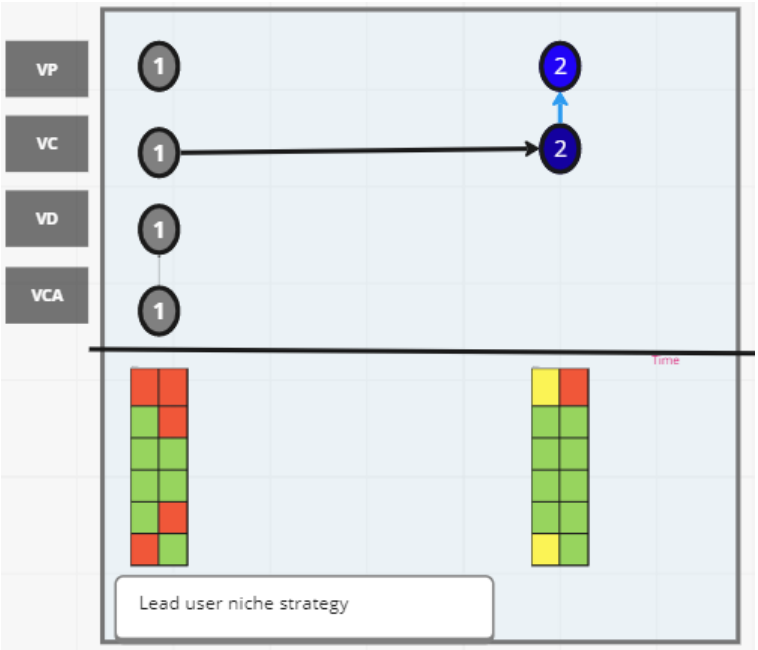

Figure 3.33: DCT business model changes due to implementation of lead user niche strategy.

From the cases explored above and the understanding of what this niche strategy entails, a conclusion can be reached that the impact of the lead user niche strategy is visible on the VP, VC and VD of company. The proposed business model changes on application of the lead user niche strategy are seen in Figure 3.34.

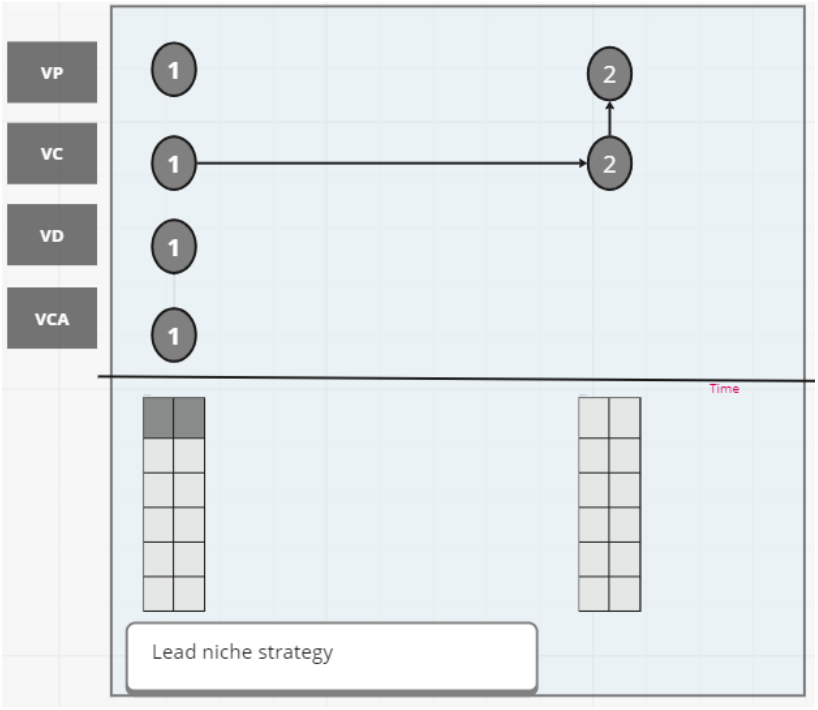

Figure 3.34: proposed impact of lead user niche strategy on the business model.

8. Explore multiple markets niche strategy
   If a product is launched in multiple markets in order to determine its ideal application, then it may be considered that the company has employed a explore multiple markets niche strategy. Based on the definition alone, a few conclusions may be drawn. First, the value proposition undergoes a change. Given that the product is being launched in a new market, it would imply that the VP of the product is slightly adapted to fit the needs and wants of the new market. Further, multiple markets would mean multiple value propositions and multiple customer segments. Along with multiple customer segments, the value delivery method must also be adapted to allow the company to reach these various new markets. Hence, by definition, it is expected that the explore multiple markets would impact the VP, VC and VD of a company.

   The story of Segway

   The segway was founded in 1999 with the concept of a personalised two-wheeler transport(J. Williamson, 2021). Segway's primary competitor was the bicycle. The Segway lost the battle and failed to achieve large-scale diffusion for various reasons, which are also the reasons for its failure. The segway was priced at 5,000 dollars, consumers saw no benefit in choosing a segway over a conventional cycle or even an 'e-scooter'. The first barrier was hence **Product** due to its price. **Knowledge of application** was the main issue in this case. The founder believed that " The Segway will be to the car what the car was to the horse and buggy" (Contributors, n.d.). **Accidents** were also an issue as Segways had a reputation for high-profile crashes(N. Gray & Hall, 2020)(Wowt, n.d.),(Isegway, 2020). Hence Segway began to focus on smaller niches. They explored multiple markets one for tourists and the other for indoor use in places such as malls.

   The business model components underwent changes which are explained below.

   (a) Value Proposition: The VP of the segway changed based on the application. One of the new markets the segway explored was indoor use. Shopping centres securities use the Segway to move inside the building. These Segways had smaller batteries and equipment that the security might need such as communications devices.

   (b) Value Creation: The value proposition was adjusted based on the market. This also led to new partners in each of these markets. Segway partnered up with the police force to provide

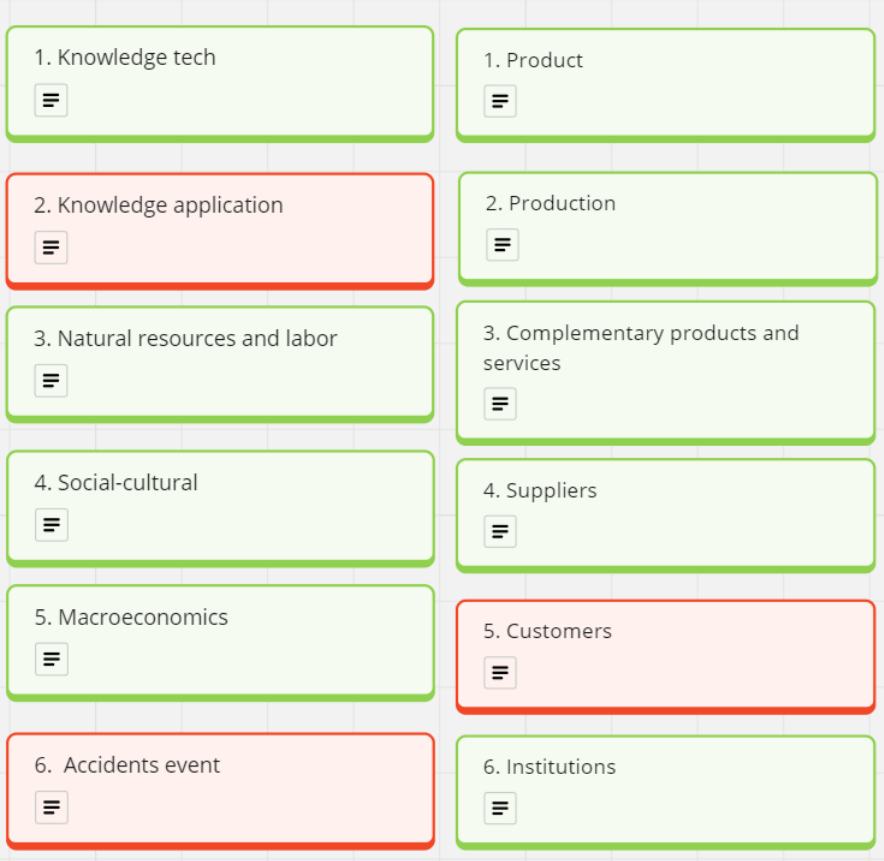

Figure 3.35: TIS Factors for Segway

them segways that were customised to their needs. The segway added more features in each of their iterations with the final iteration having a price tag of 10000 dollars after it was fully loaded with technology.

(c) Value Delivery: Segway partnered up with shopping centres, and tourist services to provide them with segways. Rather than selling to consumers, they sold to intermediate services such as renters, who bought the segway and leased it to tourists. This represented a shift from their initial approach of direct customer sales.

In the case of explore multiple markets, A decent amount of information can be derived from the definition of the strategy. The decisions are based on logical reasoning that has been mentioned where necessary. Hence for explore multiple markets, it may be concluded that it impacts the components of VP, VC and VD. The business model changes are visualised in Figure 3.36. The general impact of explore multiple niche strategies is shown in Figure 3.37

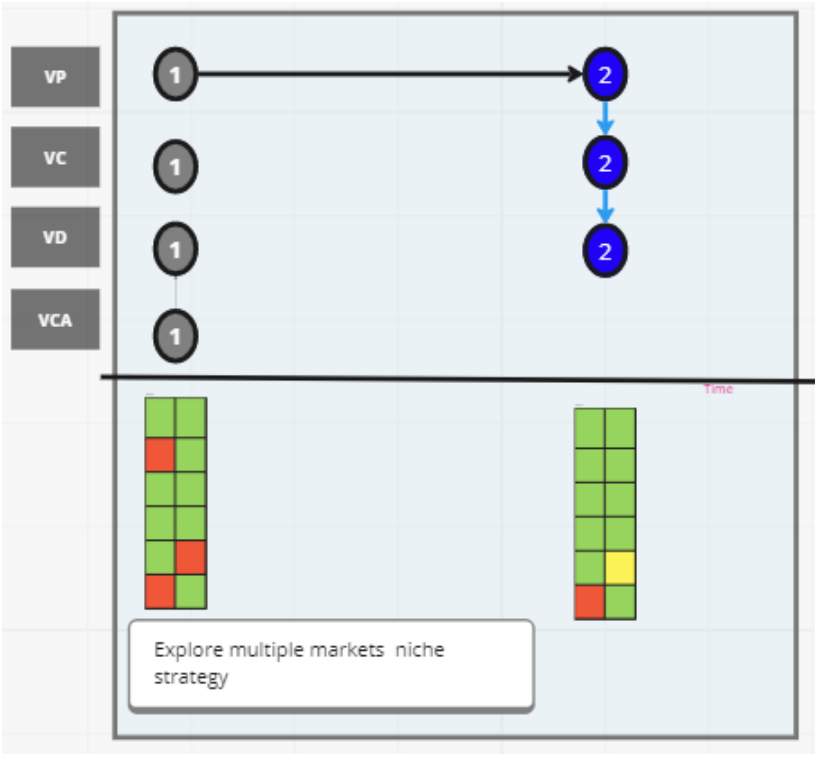

Figure 3.36: Segway business model changes due to implementation of explore multiple niche strategy.

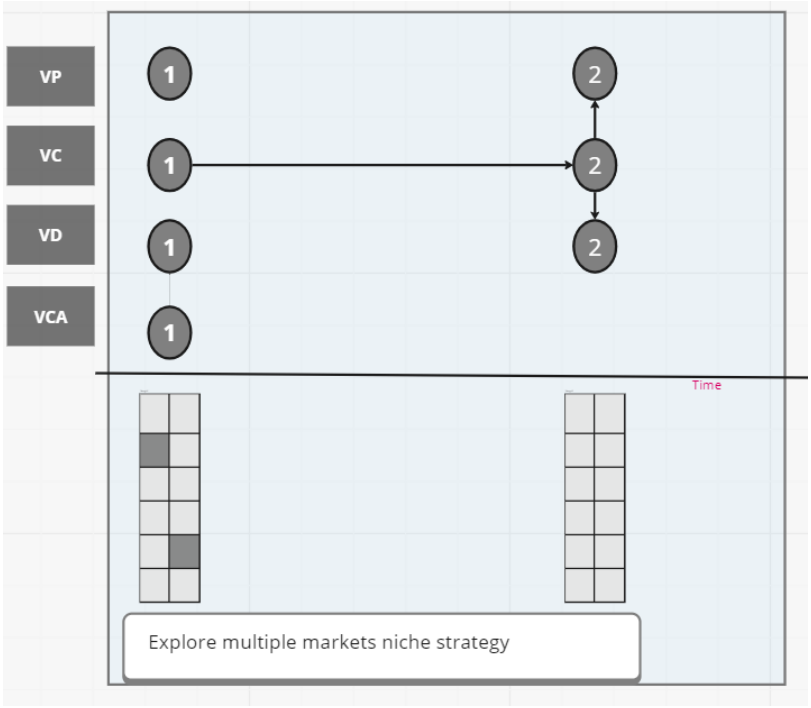

Figure 3.37: proposed impact of the implementation of explore multiple niche strategy on the business model.

9. Subsidized niche strategy

The subsidized niche strategy makes use of government subsidies. Subsidies are commonly seen to be used by companies to reduce costs. The costs here may include end-user costs or

even manufacturing costs. Examples of such are more prominent in clean energy companies. Clean technology tends to be expensive due to which companies make use of government subsidies. A solar panel startup that is based in America (IER, 2023), the company is set to receive an amount of 710 million USD. The company has already announced the plans with the money as it is said to be reinvested into the product manufacturing facilities. The US government in its new bill has announced 11 billion in investments, the part that is most interesting is that the bill lays down what the exact purpose of the money is for. The Biden-Harris Administration's commitment to cleaner energy provides rural communities with an affordable and reliable power grid while supporting thousands of new jobs and helping lower energy costs in the future." said Agriculture Secretary Tom Vilsack. The Department of Agriculture is responsible for these funds. The idea is that these funds are used to achieve technology diffusion. In this case, subsidies would aid the company in reducing its product cost. On the consumer side, government subsidies and aid act as an incentive for consumers to deploy these selected technologies/products. Such initiatives exist worldwide with different names. In India, customers can receive a subsidy from the government for installing solar water heaters, additionally, for clean energy-related costs for a consumer, the government offers low-interest loans (development Agency, 2023). Based on research on subsidies to companies, it is understood that subsidies impact value creation as the increased money would typically be re-invested into value creation. This could be done to expand a product or even commercialise a technology. The value proposition of a product may also need to undergo adaptations such that the criteria for receiving these subsidies must be met. In the case of solar water heaters in India, there are defined guidelines that have to be met for the consumer to receive the subsidies. The same goes for companies, such as in the Biden clean energy bill, which clearly lays down the conditions that need to be met by the company to receive the funds. Finally, the Value capture may undergo changes due to major changes in the cost function of either the company or the spending power of the consumer.

Electric vehicles have been around for a while now, however, their diffusion rate is still low in many countries. Electric vehicles are still quite expensive. A study by the National Resources Defense Council(NRDC) highlighted that on average electric cars are 10,000 dollars higher than the industry average (Lindwall, 2022). In the current market, due to the higher prices, the financial incentive for customers to purchase electric vehicles is low. The higher upfront costs act as a deterrent.

The story of Tesla: Model S

Electric cars serve as an example. The government gives consumers access to subsidies which lowers the cost of an electric vehicle. This enables the vehicle to be economically viable or even profitable. The lack of subsidy would mean that the vehicle is no longer affordable. It is in the company's best interest that they utilise the existing subsidies properly so as to ensure better market penetration as the direct impact of subsidies is seen on the price of the commodity (Times, 2023). Tesla is a company that wanted to make use of these subsidies in order to make their products affordable the information is provided in a post put out by Tesla written by Michael van der Sande, the Senior Vice President of Global Sales, Marketing and Service(van der Sande, 2009). At first, Tesla employed a top niche strategy with the roadster and later switched to a different strategy. The strategy involved the aid of government subsidies, tax credits and rebates to make the cars affordable as well as increase the adoption rate. By 2012 the knowledge of technology had been developed, and the production lines were ready, the **product price** however remained the main issue. The higher prices meant that consumer affordability was low. The main barrier however remained the availability of **complimentary services and products** namely the availability of charging infrastructures. This also resulted in slowed diffusion rates. For Tesla to make use of subsidies it had to change parts of its business models. The TIS factors for the same have been visualised below. The business model experienced changes in the following ways:

(a) Value Proposition: All government subsidies and tax incentives require that the vehicle meets certain criteria set by the government. This meant that the value proposition of the model S has to be adapted and in this case developed as per these subsidy requirements (Drive, n.d.). These subsidies however differ based on the local governance.

(b) Value Creation: The state of Nevada granted Tesla 1.3 Billion USD(Lecher, 2016)(Sonner

& Pritchard, 2014) in tax incentives for Tesla to set up a manufacturing plant. The nature of these incentives is not fully known. However, it can be assumed that they have impacted the Cost and revenue structure of Tesla. The US government was pushing for automakers to make more energy-efficient vehicles, under this program Tesla received an amount of 465 million USD as a loan which was given to the development of electrical infrastructure for vehicles and a new manufacturing plant. The money as claimed by Elon Musk himself would aid in the transition to electric cars(Schonfeld, 2009). All of these funds contributed towards the creation of new key resources.

(c) Value Capture: Electric vehicles are entitled to subsidies which are claimed by the customer. This would mean that the impact of the subsidy is experienced directly by the consumer. For the consumer, the total cost of ownership of the vehicle reduces, this would make it more financially appealing to customers without any action from the side of the company. This would mean that the company does not have to actively pursue price reduction unless it wants to, rather can keep prices high and can invest in product development. The establishment and operation of a new manufacturing facility entail major changes to the cost and revenue models.

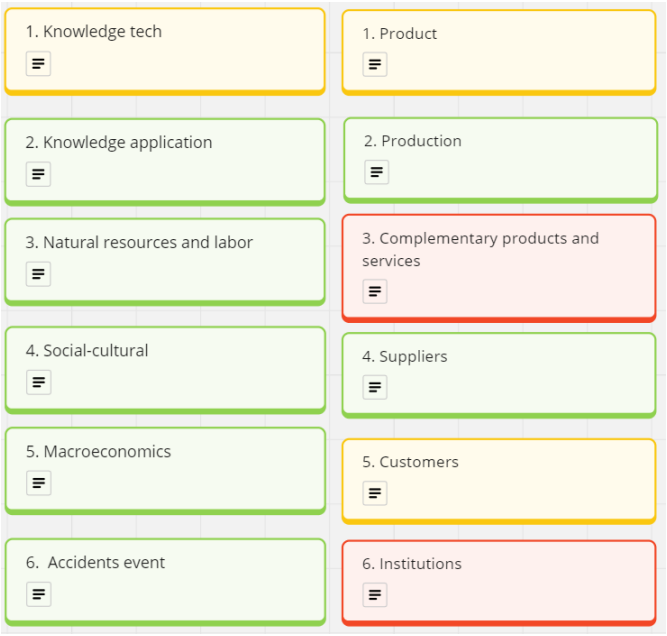

Figure 3.38: TIS factors for Tesla

The business model dynamics for Tesla are visualised in Figure 3.39. There is a major concern to be addressed with this identified relationship, the case of Tesla is very specific. Startups are good for countries, they generate employment and drive economic growth (Nassr & Siddiqui, 2023)(Savlovschi & Robu, 2011). Therefore, governments have a framework for supporting small and medium enterprises through funding or tax exemptions. Hence, it may be generalised and not just the case of Tesla. Hence, looking at the case of Tesla, clean energy technology and from the understanding of the subsidize niche strategy, it is concluded that the subsidize niche strategy would impact the VP, VC and VCA of the company.

The proposed impact caused by the subsidized niche strategy can be seen in Figure 3.40.

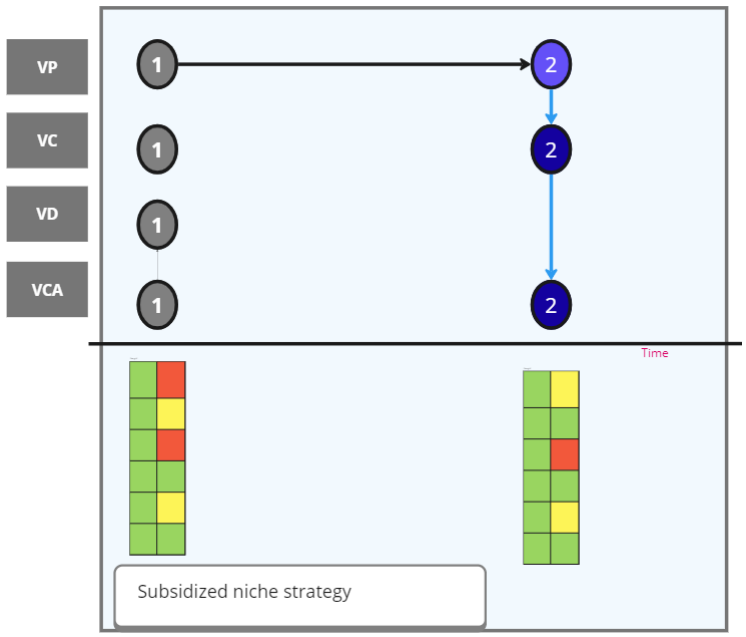

Figure 3.39: Tesla business model changes due to subsidized niche strategy

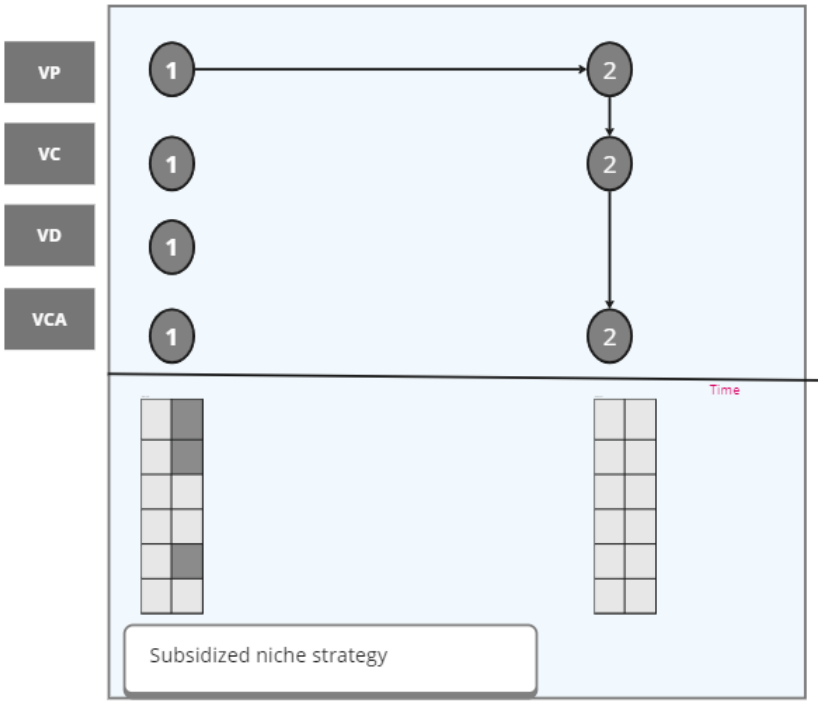

Figure 3.40: proposed impact of the subsidized niche strategy

10. Geographic niche strategy
    Geographic niche strategy involves, the company switching to a new base of operations. The strategy may be most effective if a product or company is held back by the institutional regulations in a country. An example of such would be drone technologies. Many countries have banned the use of drones for startups such as DJI, it would have been a major issue. DJI is a Chinese company, such regulations are not in place in China and hence the company is functioning. Hence, this niche strategy would be perfect for overcoming institutional barriers. Further,

even consumer-related barriers may be impacted given that the market in different locations is different. The consumer preferences in one country may not necessarily align with another, hence a company may also move to a location where the consumer environment is more favourable. Another example of such a company would be Revolut (TBH, n.d.)(Dawkins, 2021). It was initially limited to banking only in the United Kingdom, the company tried to acquire a banking licence based in Lithuania and was successful. This allowed Revolut to access the entire European market. A detailed case will be studied as well to identify a relation from theory to practicality. Based on theory alone, geographic niche strategy involves the geographical shift to overcome certain Barriers that existed in the location prior. Logically, a new location would imply that the value creation and delivery would undergo change. New resources and value-creation centres may need to be set up. New channels for interaction with the new market need to be set up. Finally, a new location would involve a new value capture as well. This could be due to tax rate changes, local regulations and even the cost of setting up and operating new value creation or value delivery services.

The story of dynamite

The story of dynamite is another example of geographic niche strategy. The dynamite was created by Alfred Noble in Sweden, and as part of his experimentation, significant damage was caused. This led to the ban on the research and development of dynamite in Stockholm. Alfred Noble then moved to the UK, developed his product and found a new market for it(Dolan, n.d.-a)(Dolan, n.d.-b). In the UK, there were many barriers to large-scale diffusion some of which were caused by local regulations. **Institutions** was a barrier for large-scale diffusion. **Accidents or events** also acted as a barrier in Sweden as an experiment gone wrong proved fatal towards the image of dynamite. Apart from geographic issues, other barriers included the lack of **Knowledge of technology** because of which there was no viable **product**. The **Production** was also poor. Hence Alfred Nobel moved to Scotland and finally found a suitable market. (Morgan, 2020),(Shearer, 2020) The business model for dynamite saw various changes which have been

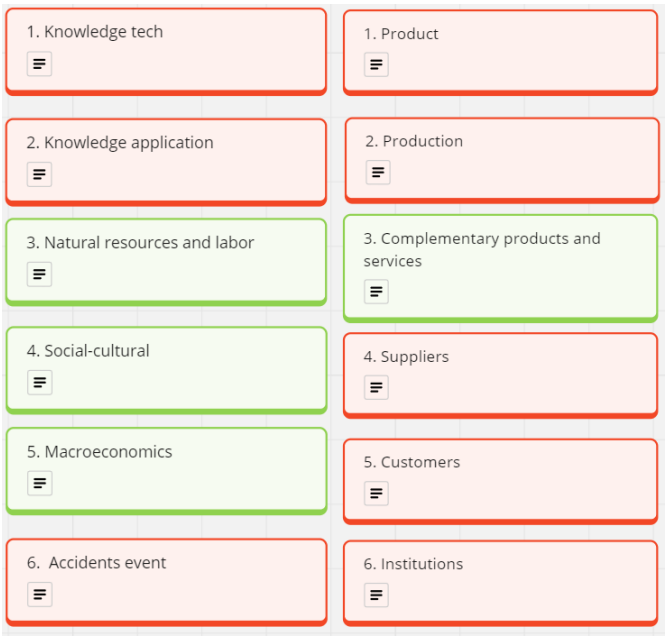

Figure 3.41: TIS factors for Dynamite

categorised into the 4 components explained below.

(a) Value Creation: Alfred Nobel was able to set up production in Glasgow only by partnering up with John Downie who aided in the setting up for the factors. This gave Nobel the key resources to start production.

(b) Value Delivery: Due to the company commencing operations in a new location, the company had to set up channels through which they could communicate and deliver value to the end users.

(c) Value Capture: The setting up of new value creation and value delivery is linked to costs. The setting up and operations of a newly acquired/built factor can have a major impact on a startup given its size.

The research and the considered example allow the conclusion to be drawn or a generic pattern to be created for the geographic niche strategy. The impacted components in the business model would be the VC, VD and VCA.

The business model changes in the case of the dynamite upon the time of application of the niche strategy can be visualised in Figure 3.42.

The proposed impact of the niche strategy can be of two kinds as seen Figure 3.43.

It is interesting to note that even value delivery and value capture may also change, however this is dependent on the specific case. For example, Netflix was a DVD rental service that mailed DVDs to the customer's residence and later switched to online streaming. Netflix launched their own content and had a subscription fee. In the case of Netflix all 4 components of the business model change, however, this cannot be generalised for all companies/technologies (Kamps, 2023)(Sun, 2022). The multiple markets strategy in the case of Netflix proved to be fruitful as it accelerated the company's growth. This forced Netflix to invest in new content and expand operations in various countries. Netflix therefore, violates the identified pattern, however, this difference from the case of Segway can be attributed to the nature of the product and service itself.

In the case of new technology, another example that comes to mind is that of Momo Medical. It is a startup that makes bed sensors. Initially, it was aimed at reducing the workloads of nurses in hospitals. The company quickly realised that due to the quick bed turnarounds seen in hospitals, their product utilisation was poor. The company found a new market in old age homes which better suited their product better. In this case, it is important to note that the company did not have to undergo major changes in the value proposition due to the nature of the markets. However, the components of value delivery had to undergo changes so as to reach the new target audience. The information obtained or discussed is part of a guest lecture provided by an employee of MOMO Medical delivered for the course Technology, entrepreneurship and Innovation.

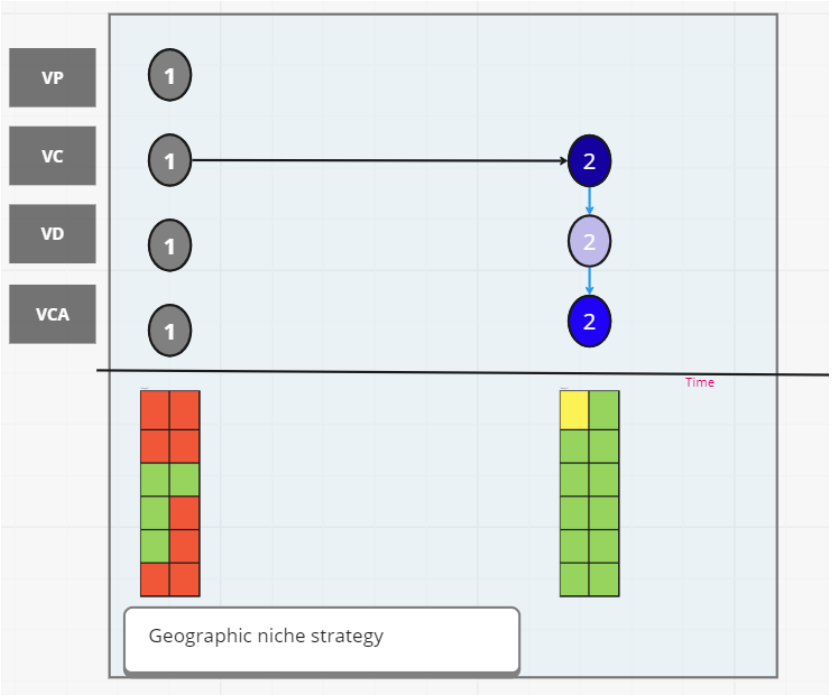

Figure 3.42: Dynamite business model changes due to the implementation of geographic niche strategies.

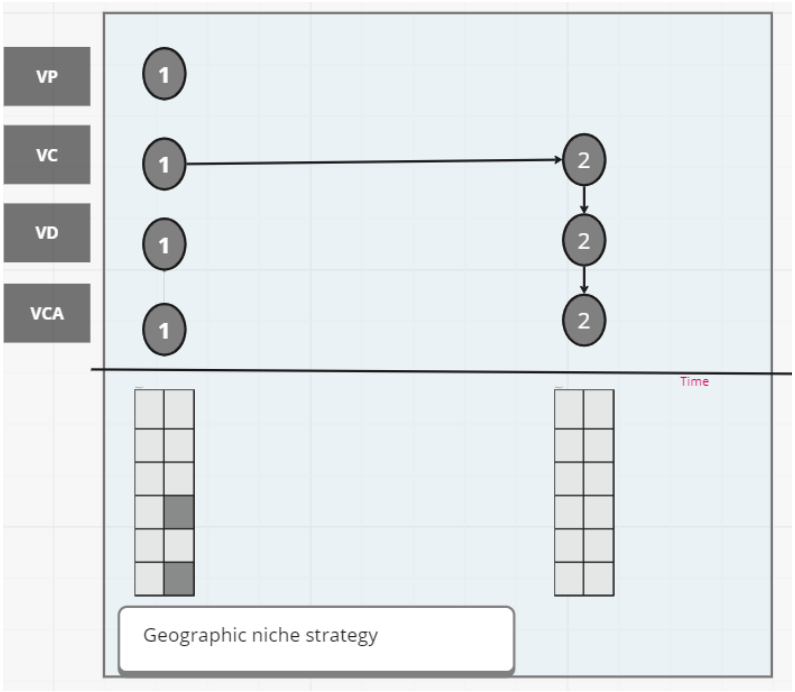

Figure 3.43: Proposed impact of implementation of geographic niche strategy on the business model.

3.3. Proposed impact of niche strategy on the business model

Based on the above niche strategy and the company cases a table maybe created that encompasses all its conclusions. The Table 6.1 highlights the conclusion from each niche strategy. While this relation is claimed to be generic, it is just a proposed relationship identified by the author. Evidence has been cited as to how these conclusions have been reached based on definition and historical cases where needed or when it was possible.

Strategy	Impact BM components	Examples
Demo and Develop	VP,VD,VC,VCA	Telegraph
Redesign niche	VP,VC,VD,VCA	WD-40, Post-it notes
Stand-alone niche	VC,VD,VCA	Tesla, GoPro plus
Hybridization or adaptor	VP,VC,VD,VCA	Toyota Prius, Amazon Alexa
Top niche	VP,VC,VD,VCA	Telsa, Fitbit
Educate niche	VC,VD,VP	IBM, Arduino
Lead user niche	VP,VC,VD	Street Scooter, DCT
Explore multiple markets	VP,VC,VD	Segway
Subsidized niche	VCA,VP,VC	Tesla
Geographic niche	VC,VD, VCA	Dynamite

Table 3.1: Identified relation between niche strategies and business model components.

4

Conceptual framework

The chapter contains and presents a new business model dynamics framework that relates the business model changes to the applied niche strategies of the company. It may be even termed as the **business model evolution canvas**. It can be called evolution as it tracks changes in the business model in response to external and internal factors. The framework used is based on the framework cited in (Kamp et al., 2021). The framework is a combination of the business model dynamics canvas and the TIS framework. The core building blocks of the framework are the same, however, the application and the definitions have been modified for the new application. The framework consists of various terms, all of which are defined and explained below.

4.1. Model Assumptions

As mentioned, this model is a culmination of multiple models and hence their assumptions are also taken into consideration.

TIS Based assumptions

The TIS framework in this research is used to evaluate all the barriers to large-scale diffusion faced by the company or the new technology. The TIS-based assumptions used and addressed in the study are mentioned below.

1. The status of the TIS building blocks and the influencing conditions should be reconsidered over time to reveal changes in the TIS that require new or adapted introduction strategies. This reconsideration is visualised on the timeline.
2. There are seven building blocks and seven influencing factors (R. Ortt & Kamp, 2022).
3. Influencing conditions can block large-scale diffusion by impacting the building blocks alone.
4. The TIS framework is complete in terms of the factors evaluated by the framework. The TIS is assumed to give a complete picture of the market scenario faced by the company/startup.

Business model dynamics based assumptions

1. The changes in business dynamics are initiated due to a change in one component. The changes can be made to multiple components at once where one change is not necessarily a consequence of another.
2. The changes are represented as instantaneous. Changes in the market occur over time and this means that the TIS factors cannot simply jump from red to green due to the application of one strategy and the work required to do so is more than what is visualised. Technology diffusion is something that occurs over time. This would imply that even though a particular barrier is in favour, diffusion may still not occur at that instance of time.

Strategy based assumptions

1. All decisions made by the company/startup regarding changes to the business model are strategic and depend on the barriers and influencing conditions identified by TIS.

2. Niche strategies aid in breaking down or circumventing a barrier that has been identified.

3. Niche strategies in historical cases are considered subsequent and not simultaneously.

The conceptual model will be applied in each of the niche strategies and each of the companies. This is done to show the application of the framework. It is interesting to note that for each company the change represented in the framework may or may not change while applying the same niche strategy. This highlights an important observation, the identified and concluded relation is a proposed generic one. These relations are the basic relations that are seen in all cases researched. Every other change is only an addition to these base changes.

The application of the framework and niche strategies inherently rests upon an underlying assumption. This assumption is that the actions of one company can overcome a market barrier. In practice, however, it is unreasonable to expect one company to be able to cause a large systemic or non-systemic change. An interesting argument that can be made is to approach the framework from different points of view. The barriers that are visualised are the ones that at that specific point in time existed for the company that hindered large-scale diffusion. Historic examples show that a company alone can influence major changes or at least it is represented this way, however, it is important to note that major changes take time and effort. This time taken can be represented by the implementation of the right strategies but the change in barrier is not made yet. This highlights that while the necessary changes have been made in the business model of the company, the impact of these changes on the barriers has not been seen yet. This happens to be one perspective, to look at the barriers from an industry perspective.
Another point of view that could be considered is from the viewpoint of the company itself. This however may be limited to certain factors only. One such factor is customers. For a small company or a start-up that has just begun production, the number of customers it can serve is limited. This means that the hypothetical company is capable of servicing only a few customers meaning the barrier for the company can be marked as green despite the lack of a large consumer base. The point of view is purely dependent on the company in terms of its long-term goals. A company may mark the barrier as green or supportive if it is looking at its current status and aims to sustain it. If at its current capability, the capacity of the company is maxed out. It would mean customers are not an issue despite having only a limited number but rather the production becomes an issue. This identified problem arises purely from a difference in perspectives. The company in this case might choose to mark the production and customers as supportive given that the company is limited by its capabilities at that time. Hence, while using this canvas, the goals of the company have to be defined properly. An example of such a company is Lululemon (Saibil, 2019)(Reuters, 2010). The company caters to a small base and would like to keep it that way. Hence, while any strategy might be employed to solve any barrier that may arise, from the perspective of the company the barrier of customers is never an issue despite only catering to a very small niche.

4.2. Definition of elements in Framework

The business model elements have been organised and can be broadly classified into 4 categories which are discussed below.

4.2.1. Value Creation (VC)

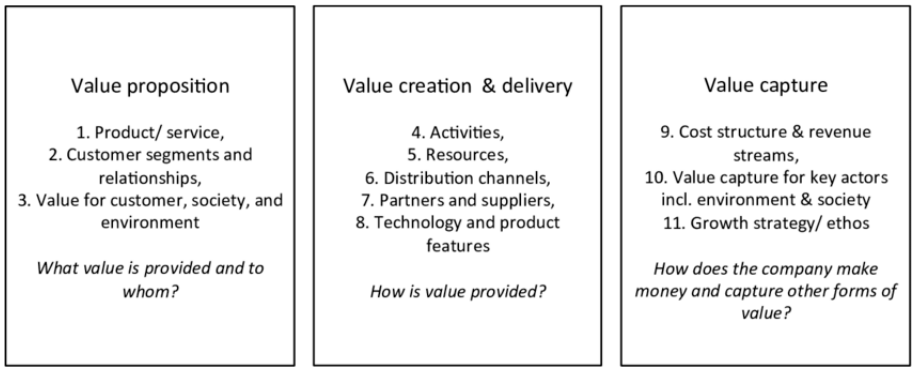

Figure 4.1: Classification of the 9 elements into the 4 components(Bocken et al., 2015).

Value creation(VC) refers to all components of the business model that are involved in creating or adding value. Resources taken as inputs by themselves produce no value, and hence process and work have to be done to these resources to create value this is referred to as value creation(Bowman & Ambrosini, 2000).

4.2.2. Value Delivery (VD)

Value delivery(VD) refers to how the created value is delivered to the end user. This would include the distribution networks, key partners, suppliers etc(Arash Rezazadeh, 2018). The elements of the business that fall under value creation and value delivery as seen in Figure 4.1.

While there is an overlap between value creation and value delivery, they can be differentiated based on how this value is utilised by the organisation. For a product to reach the consumer, first the company has to create the product and then the company also has to deliver this created value to the consumer. If any element is involved in how the value is created rather than how it reaches the customer, it would be put under the value creation. Distribution networks for example can be considered to be value delivery. Whereas a manufacturing unit would be considered as value creation, as it involved the creation of value.

4.2.3. Value Capture (VCR)

Value capture refers to how the value is captured and by whom it is captured. This would include the cost and revenue structure of the company as it is through these components that the firm or organisation captures value. The value capture can also be expanded to include the value captures for the key actors or partners involved as well (Bowman & Ambrosini, 2000).

4.2.4. Value proposition (VP)

The value proposition is vital to communicating the value provided by the company or commodity to the end-user(Payne et al., 2017). It refers to who the value is provided to and what the value provided is. The elements that come under value proposition are shown in Figure 4.1

4.2.5. Primary change or strategic change

A change made to a particular component of a business model based on the strategic choices made by the company. These choices are based on existing barriers and challenges that may need to be overcome before large-scale diffusion is possible. An example of the same would be, the change in value proposition due to a change in the customer segment. For a new customer segment, the value proposition must be modified to align with their needs instead of the old customer segment. Here VP experiences a primary change. The primary change definition is kept the same based on (Kamp et al., 2021)

4.2.6. Secondary change or consequential change

A secondary change is the changes made to the business model of a company in order to maintain consistency after a primary change has occurred. The same example can be extended to explain a secondary change. The primary change has occurred in the VP to suit the new market. This would potentially mean that the product has been modified. These modifications are reflected in VC(Value creation) in this case. These changes could be in terms of a new manufacturing method, new suppliers, new key partners etc (Kamp et al., 2021).

4.2.7. Forced Change

A Forced change is defined as the change that a company is 'forced' to make to its business model due to accidents or events that have taken place beyond the control of the company. The Suez Canal blockage that took place in 2021 serves as an example. A container ship blocked the Canal and hence caused major logistical disruptions (Jaganathan, n.d.). This forced many companies to make changes to their operations to reduce the impact caused by this blockage. Companies that use these trade routes are now forced to make changes in their business model. The company has or had no intention to make such changes, but rather was forced to make such a change due to an external accident or event.

4.2.8. TIS Framework

The TIS framework can be employed to study the existing market conditions and determine the barriers and influencing factors affecting the large-scale diffusion of high-tech products. When these barriers and influencing factors are visualised, they follow a traffic light system with 3 colours as seen in Figure 4.2:

1. Red: Influencing condition or TIS building block is incomplete or incompatible.
2. yellow: Influencing condition or TIS building block is partly complete and/or partly compatible.
3. green: Influencing condition or TIS building block is complete and compatible.

Figure 4.2: 12 factors and their Miro representation.

The TIS representation is used in the framework below the timeline. The 12 factors are traced along with time and are changed based on the market conditions. Figure 4.3 shows an example of how it is to be used. It is important to note that the changes shown in the example are meant to be illustrative only

and do not represent the actual changes for when the niche strategy is applied. It is also important to note that the TIS factors are comprehensive when evaluating the factors experienced by the company. This means that any barrier that the company might face is already accounted for in one of the 12 factors and hence the choice of niche strategies can be made based on these 12 factors alone and is internalised. Any foreign change that is unaccounted for in these 12 factors is labelled as an external change.

4.2.9. Magnitude of changes

The change in each element of the business model can be of varying degrees. The degree of change is represented by:

1. Dark Blue: The change made to the component is major.

2. Light Blue: The change made to the component is intermediate.

3. Lavender: The change made to the component is minor.

4. Grey: No change is made to the component.

It is important to note that the severity of change is assessed on a case-by-case basis and there is no defined metric as to when a particular change can be considered minor or major. In each case, the severity is to be assessed with respect to the company's business model and justified accordingly. This feature of the tool needs more research in order to define a scale on which the impact can be determined. At this instant, this feature is kept in hopes that scale can be defined in later research.

4.2.10. Niche strategies

Coloured boxes are placed in the background with a light shade. The purpose of this box is to highlight the market state. Each box corresponds to the duration for which a niche strategy or a mix of niche strategies is applied. The box starts at the point on the timeline during which the niche strategy is employed and ends at that point on the timeline at which the niche strategy is no longer used or required. Inside these boxes, the changes made to the elements during the particular employed niche strategy are shown. In Figure 4.3, it can be observed that the changes can occur multiple times in the same niche strategy without a reflected change in the market barriers. This would imply that a particular niche strategy has been employed, and the necessary strategic change has been made, however, the market barriers have not yet been overcome. Further changes are then made to the business model until the barrier is overcome. The number inside the ovals for each component represents the version of the component being used at that instant of time. The boxes may also overlap implying that a particular niche strategy is still under use when a new strategy is employed.

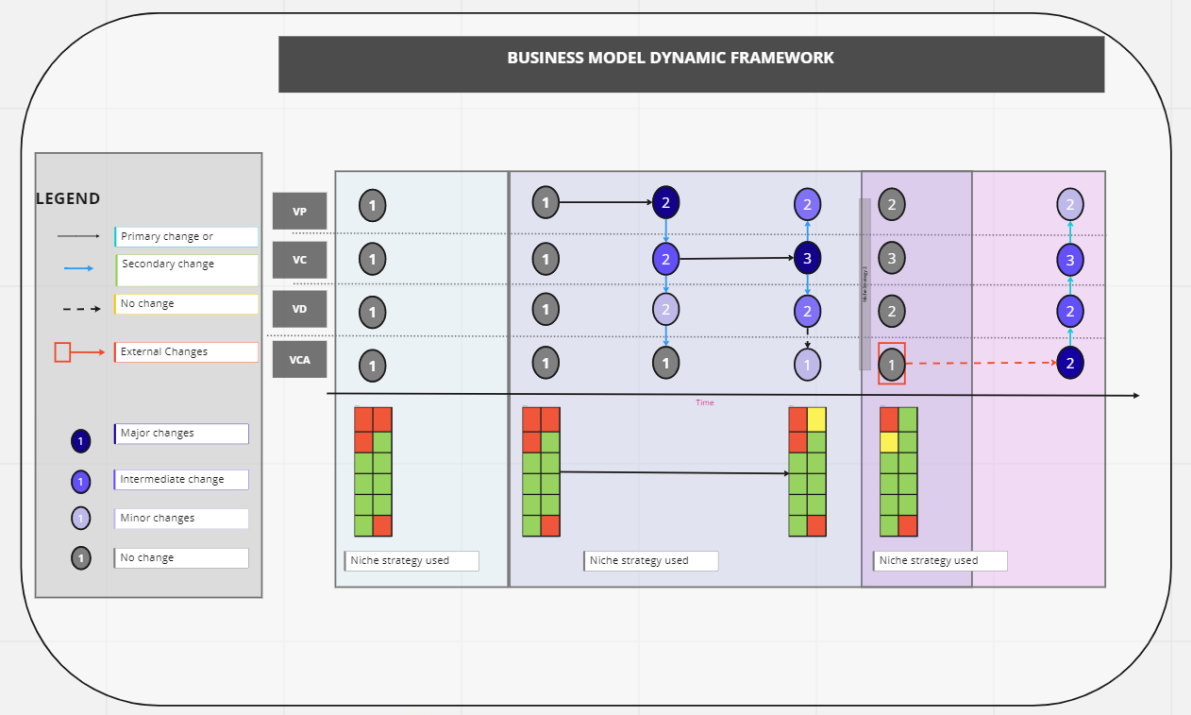

Figure 4.3: Proposed business model dynamics framework.

4.2.11. Proposed Niche strategy-Barrier relationship model

The impact caused by the application of each niche strategy is visualised for each case. This acts as a key that shows which components of the business model change and which barriers are impacted as a result of the application of a niche strategy. Every niche strategy has been given a proposed impact. The model is built on research that is mentioned in the literature section, past company cases and inferences or observations. The TIS factors are below the timeline. Black or dark grey resembles that the highlighted factor acts as a barrier to large-scale diffusion. On the right side of this i.e. the next instance in time after the application of a niche strategy the affected barriers change. This is represented as a change from black or dark grey to grey which means that those barriers that were hindering large-scale diffusion earlier do not exist anymore. Figure 4.4 represents the evolution of barriers, the description of which has already been discussed.

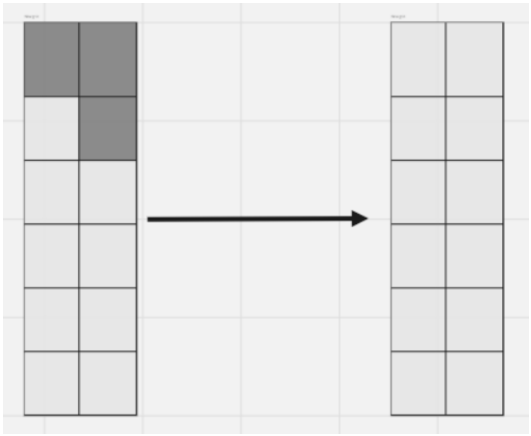

Figure 4.4: TIS Factor change

4.3. Application of framework on historical cases.

The framework is applied in each of the company cases discussed in the previous chapter to illustrate the conceptual framework. Moreover, by doing so, a generic map can be created that visualises how a niche strategy impacts the business model dynamics of a company and its barriers. The legend for the business model dynamics framework is seen in Figure 4.5, Each visual has been zoomed in to for illustration. The legend has been cut out of the visualisation and hence has been shown separately.

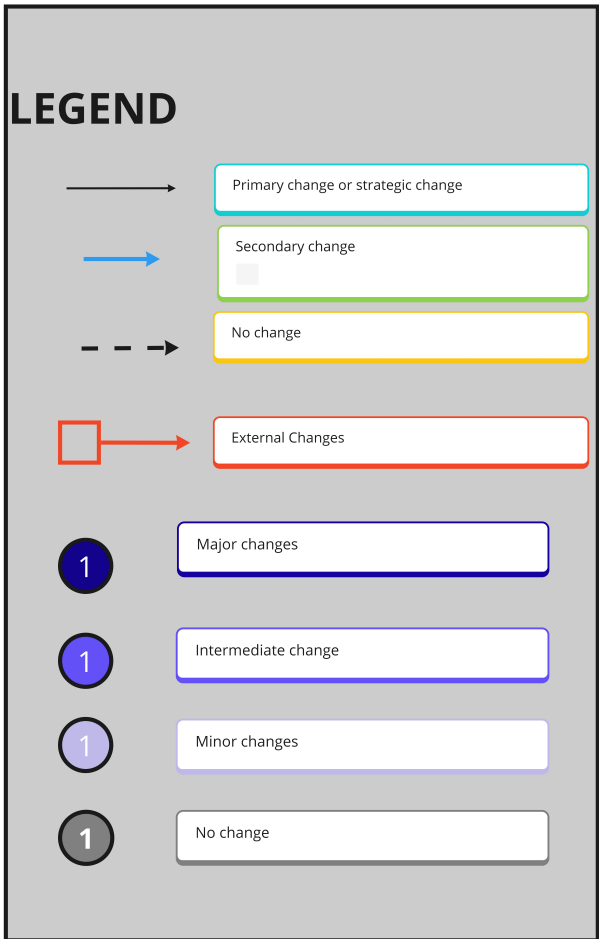

Figure 4.5: Legend for the business model dynamics canvas.

4.3.1. Tracing Dynamics using the framework.

Tesla has employed various niche strategies. If the application of niche strategies is done on a timeline, then the business model dynamics of Tesla can be traced. The first niche strategy applied is the top niche strategy. Tesla launched the roadster as its first vehicle. The vehicle was priced significantly above the industry standard for a similar vehicle. Electric vehicle technology was in its infancy when Tesla launched the roadster. The objective of the roadster was to act as a test for electric vehicles. It was sold to the top niche which enabled the company to make large profits which could then be invested back into R&D. The barriers before the application of the niche strategies are identified to be **Product**, **Knowledge of technology**, **production**. Other barriers that were present at this point also included **complimentary products and services**. These barriers were overcome in stages through employing various niche strategies. The top niche strategy aided the company in generating revenue and partially overcoming the barrier of knowledge of technology. The strategy used after the top niche was the subsidized niche strategy. The technology got better and reached a point where Tesla was confident to launch an electric car for the mass market. There however was one issue. The cost of electric cars was higher than the average price of similar gasoline vehicles. The **product price** was now a barrier. To overcome this barrier, Tesla employed the subsidized niche strategy to obtain funds and the subsidy reduced the cost of the ownership thereby appealing to more customers. The standalone

niche strategy was the final strategy used by Tesla. This strategy aimed at overcoming the barrier of **complimentary products and services**, the knowledge of technology may or may not have been fully developed at this time. It is difficult to identify the niche strategies explicitly and study their impact. Hence, it was considered that the subsidize and standalone niche strategy may have been employed simultaneously. The business model dynamics for Tesla on the application of the three niche strategies is in Figure 4.6

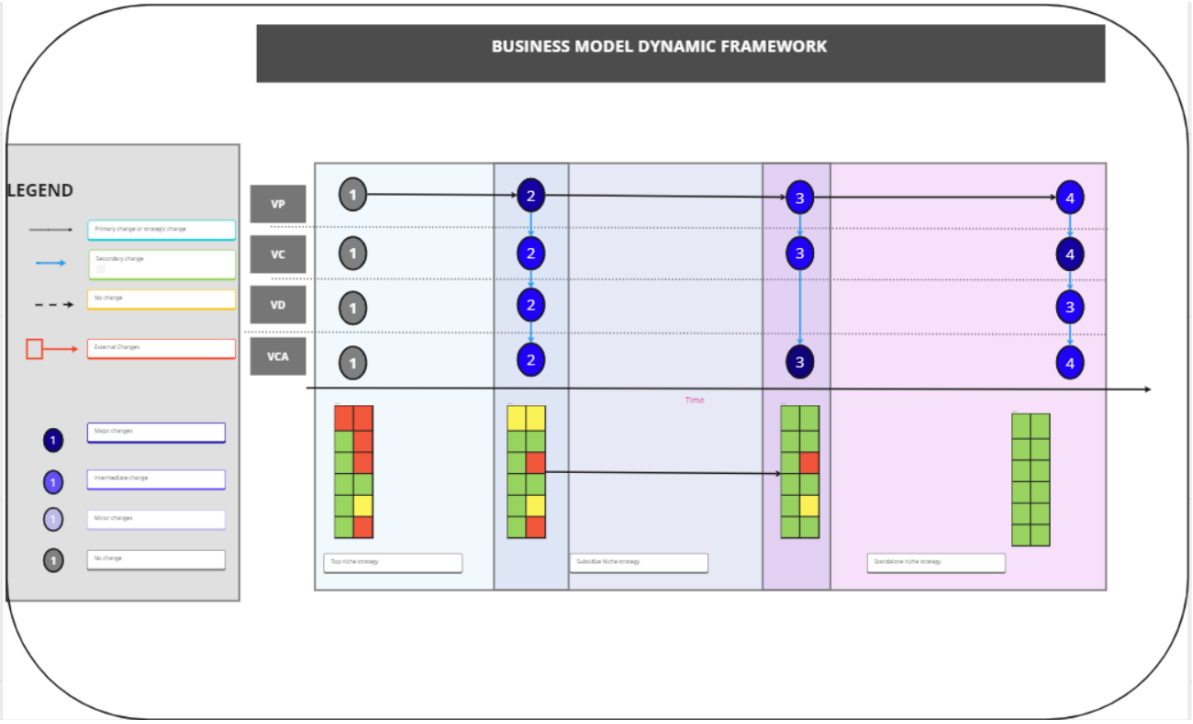

Figure 4.6: Tesla business model dynamics.

4.3.2. Feedback Loop

The new framework utilises the x-axis as a timeline, above it the changes in the 4 components are tracked based on the above-defined definitions. Below the time, The TIS barriers and influencing factors are visualised. The purpose is that at a given time on the timeline, the business model changes can be seen as well at the 12 factors at that instant of time. This framework can therefore work as a feedback loop for the company. This can be explained using the proposed framework visualised in Figure 4.3. In Figure 4.3 a generalised canvas is shown with all the elements. The first element is the timeline. Above the timeline, the changes in the elements are tracked and below the 12 factors are shown. Hence if at a particular time, the business model is evaluated, the user would get complete information on all the changes in the elements so far as well as the evolution of the 12 factors. This would make it easier for those involved in business development as it can help visualise information easily. An interesting example would be the ”Redesign Niche Strategy”, it is assumed that the value proposition undergoes a primary change and the other components experience a secondary change or a consequential change. If the product is redesigned for a new customer segment corresponding changes will be seen in the business model dynamics. The 12 factors can be re-evaluated at a future point in time to see if the changes had any impact. If there is no impact, a change can be made again, the new changes can be highlighted. This method would also provide more information on the path taken by the company. Through various examples that have been discussed the feedback loop may be identified. The case of Tesla serves as a good example of this purpose. They started with the top user strategy and eliminated one barrier. They proceeded to choose the next strategy as a result of this strategy. In Figure 4.6 the loop can be identified clearly. This is merely an identification of a pattern but more information is needed to confirm this hypothesis.

Based on this hypothesised loop, a flowchart of the process may be identified and visualised as

seen in Figure 4.7. The flowchart represents the feedback loop but in this case as a decision tree to highlight the flow of activities that lead to business model changes.

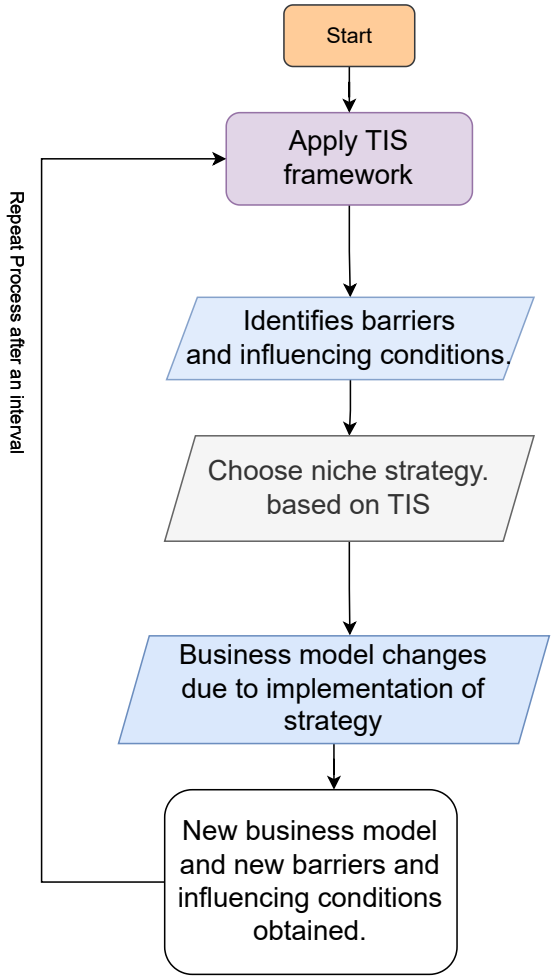

Figure 4.7: Flowchart for the decision-making process regarding niche strategies and business models.

4.3.3. Proposed strategy-barrier Relationship

A relationship has been identified between niche strategies and the business model, another relation can also be identified from the same framework which is the relationship between niche strategies and barriers. The choice of strategy depends on barriers, this has been established in the previous sections. Niche strategies are chosen based on a combination of barriers, however, the niche strategy may impact more than just the original barriers. An example would be a subsidized niche strategy. By definition, the niche strategy involves the use of subsidized to increase end-user affordability. Hence, it is expected that the customer barrier will be overcome. Two additional barriers are also impacted by the subsidized niche strategy, these are not expected. They can be explained by taking the same case discussed above. Tesla used subsidies in multiple ways to benefit them. First, government incentives for electric cars aided in attracting customers. Second, the product barrier is impacted not just because it is cheaper for consumers, also a new production system was set up with the aid of government subsidies and funds. The combination of customer-side price reduction and production-related cost improvements led to the product barrier being resolved. The relation between the nice strategies and impacted barriers is summarized in Table 6.2. The hypothesis that each niche strategy breaks down specific barriers has been assumed before in (Vinitila et al., 2017). This set of historical cases may prove this hypothesis and hence establish a relation between niche strategies and barriers.

Strategy	Impacted Barriers
Demo and Develop	7,1,2
Redesign niche	7,8,1
Stand-alone niche	3
Hybridization or adaptor	7,1
Top niche	7,1,2
Educate niche	7,1,5
Lead user niche	7,1
Explore multiple markets	8,5
Subsidized niche	1,5
Geographic niche	4,6

Table 4.1: Proposed relation between niche strategies and Barriers.

The numbers in the impacted barriers column correspond to the number next to the barrier in Table 6.3

7-Knowledge of Technology	1-Product
8-Knowledge of application	2-Production system
9-Natural services and labour	3-Complimentary Products and services.
10-Soico-cultural	4-Suppliers
11-Macroeconomics	5-Customer
12-Accident events	6-Institutions

Table 4.2: TIS factors with numbers

5

Framework Testing

The theorised conceptual framework has been applied to the historical cases based on which it was built. Hence, the framework has to be tested before it can be considered validated. In this chapter, the framework is tested on two companies/ startups namely Kitepower and Kitenergy. The study conducted on Kitepower is more detailed as it has been studied as a longitudinal case. The study into kitenergy is not as detailed as the case of Kitepower. Kitenergy serves as a comparative case with Kitepower as another AWES company. AWES is a green energy technology that is currently in the research and development phase. The technology is yet to achieve large-scale diffusion. The two cases illustrate the same and each of the cases has been explained in detail below.

5.1. Kitepower

The historical cases provide us with a cross-sectional analysis that is able to show the effect of niche strategies on the business model. Longitudinal studies however explore a time dependence to see how they evolve over time. In this case, since the objective is to study the business model dynamics of a company Kitepower once again appears to be a good case. Kitepower has also been used as a case study as part of the TPM course ”Technology Entrepreneurship and Innovation”, the advantage of this is that there is plenty of information available regarding Kitepower. Hence considering, the amount of information and the unique position of the company kitepower is chosen as a case study.

Kitepower began in 2016 as a spin-off (Kitepower, 2023a). Kitepower is the specific case taken in this study to perform a detailed study on. The study is performed from 2019 to 2022. The study makes use of reports from the course ”Technology Entrepreneurship and Innovation” and ”Technology Entrepreneurship and Sustainability”. These courses are cumulatively offered 4 times a year. This means that there are reports that are published every 4 months. Hence, it can be considered that every 4 months the information about kite power and its ventures is reviewed and updated. For Kitepower, the section will follow the timeline based on the reports and research. Kitepower is a technology-based startup that aims to generate energy from Airborne wind, in this day and age with the push for sustainability being so strong, Kitepower proves to be an ideal choice and potentially helping a company such as Kitepower could aid in the greater goal of energy transition. In the case of Kitepower, the TIS framework is applied at each instant of time and studied in detail as to what niche strategy has been chosen and applied.

Kitepower had their first event in 2017 where they presented their ground station which was a major milestone for a young startup. Kitepower continues on its journey to growth with its first milestone planted. The second milestone was in 2018 which involved a training session held by Kitepower for the Dutch Ministry of defence. The site was in the province of Groningen and this is the first major collaboration of Kitepower. Kitepower was able to achieve this collaboration as a result of winning the Defence Innovation Competition Project in 2016 which also bagged them an grant of 200 thousand euros. Kitepower continues its collaboration work and proceeds to create new competitive advantages for their product. These included:

1. Modular and mobile unit

2. Easy operation and deployment
3. Silent system operation
4. Higher capacity factor than solar PV

These were the new value propositions developed as part of this demonstration. The value proposition changes were an overall improvement, this made the product more easy to install and operate. Moreover, for the military application, these features were ideally what was needed as said by the company. In 2018, the company hosted a demonstration of their 100KW energy system to an international delegation of sustainability experts. Kitepower published on their website the potential application of kitepower for farmers. They also published articles regarding the product use even in standalone cases. Kitepower highlights that their product can find application in multiple markets. It is, however, just articles published and even as confirmed by the company. They say that they were identifying possible applications, however, there was no drastic change to VP. This marks, however the start of redesign for applications in other customer segments. The expansion of Kitepower continues as they received a new advisor and investor in the form of Hendrik Hutting in November of 2018. Kitepower also concludes the year 2018 with a total of 50 test flights. In the 50 test flights, a total time of 96 hours was recorded out of which the kite was operational for 26 hours.

The June of 2019 was another milestone for Kitepower as they began a collaborative project with the Dutch defence as mentioned above. Kitepower was also voted to be within the top 100 most innovative firms in the Netherlands. All of these are good signs for a startup as all the awards and recognition the company gets are good for its credibility and its image said the company. Kitepower attended the Airborne Wind Energy Conference of 2019, with other AWES companies such as Skysails, and Makanipower. This proved to be a platform for the exchange of ideas and information. One of the organisers of the event was the co-founder and advisor Roland Schmehl who recollects this to be an exciting event that enabled many companies working on AWES technologies to come together. In November of 2019, kitepower received an ISO certification which the company terms as a ” milestone in its professional growth”. 2019 also marked the beginning of a research collaboration spearheaded by the NEON research granted 4 PHD as part of the Kitepower research group. The NEON research group consists of many Dutch universities as was headed by TU Eindhoven at the time of this decision. Kitepower and another AWES company called Ampyx Power funded the AWES group (Delft, 2019).

Kitepower kicked off 2020 by moving into a new office along with their workshops. Kitepower relocated to the Kabel district in Delft. Kitepower held a product demonstration at Melissant, Goeree-Overflakkee in the Mulders farmland in May of 2021. The demo later served as a test site and a pilot project for the company. The project operates weekly and has been seamlessly integrated into the farm. This potential was theorized by Kitepower in 2018 but was set up as a pilot in 2021. Dromec joined Kitepower as their manufacturer for the ground station. The site had been prepped for testing since February and operations commenced in may after receiving the All in one permit. Kitepower then went on to secure a 3 million euro investment in June from ENERGIIQ, Stichting ifund and Windhandel Beheer. The investment was meant to be invested in the company for further development. The press release and the company CEO Johannes Peschel both confirm that this investment will aid in developing the plug-and-play capabilities of the company so the system can be employed in rural and harsh conditions. Finally, the collaborative project with the Dutch defence is underway at Aruba and Kitepower saw the deployment of their 100 kW Falcon in Aruba (Kitepower, 2023b). This project also highlighted the capability of Kitepower to operate in remote areas while ensuring minimum logistical effort in comparison to wind turbines.

Kitepower hosted a webinar in 2022 January in collaboration with an NGO about their product and technology. A crowdfunding campaign was also started on Crowdcube to attract more investment into the company. It is clear that the company still does not generate revenue by delivering value but rather through investments or grants. 2022 May was also a major milestone for Kitepower due to a regulatory change in favour of kitepower. The change allowed and made it easier for Kitepower to operate their kite which was now designated as a drone across Europe. This removed the barrier of institutions that existed previously. Kitepower also joined the MERIDIONAL proposal which was a research backed

by a funding of 6.7 million EUR out of which Kitepower is set to receive around 240,000 euros. The research objective is to develop a tool that aids in the efficiency increase of AWES technology. The AWEC 2021 was held in the summer of 2022 and similar to the 2019 edition, it proved to be a platform for collaboration and innovation in the AWES field. After the successful run in Aruba, Kitepower also added island operations to their portfolio and hence it can be said that Kitepower entered into a new market.

2023 saw further expansion of the Kitepower team with a new COO in Walter Hueber, a new product manager and a test flight manager. Kitepower believes the expansion is crucial for them as the momentum for Airborne wind energy gets stronger. Indeed there is added momentum for AWES and a part of the credit has to be given to Kitepower due to its active involvement in development as well as in organisations such as Airbone Wind Europe that work towards the growth of AWES technologies.

All the information obtained regarding Kitepower has been obtained from their official channels, university publications, and personal interviews. Further, an interview was conducted with Walter Huber the COO of Kitepower. Other sources of information include guest lectures from Professor Roland Schmehl, one of the founders of Kitepower.

5.1.1. Kitepower 2019 June

Kitepower as of 2019 had only one customer or collaborator, the Dutch Ministry of Defence. The technology is still very much in development. Customers or consumers cannot purchase a kite but rather can only pre-order. This provides evidence as to the lack of **product**. Further, the lack of a commercial product would imply that there is a lack of the **production system**. Kitepower on their website indicates the necessary technology to manufacture the kites comes from various suppliers. Such a system is fine at its current stage, however, this would act as a potential barrier to large-scale diffusion. The lack of a product is due to the lack of complete **knowledge of technology**. The **knowledge of application** is not necessarily a barrier as the sector chosen by kitepower limits its potential.**Macroeconomics** is a barrier to large-scale diffusion as there is no incentive to invest in Kitepower given there is no guarantee of returns. The lack of a consistently working prototype hinders the trust of investors. While the economic conditions were not really a hindrance, Kitepower would have benefited from the additional investments. **Customers** act as a major barrier as there is a lack of customers. This absence can be linked to the lack of a product, poor public image due to safety concerns, and the lack of knowledge of technology. **Accidents and events** refers to the public perception of the technology. Public concerns regarding the safety of the AWES systems block the large-scale diffusion. This information is provided by Roland Schmehl a key individual working with Kitepower. He reiterates that public support is poor due to safety concerns about the product.**Institutions** do act as a barrier due to flight restrictions or no-fly zones that prevent the application of the technology and limit its freedom. Hence institutions also act as a barrier to large-scale diffusion The factors highlighted in this section will continue to remain as barriers unless stated otherwise in the following subsections. The barriers to large-scale diffusion to kitepower are shown in Figure 5.1.

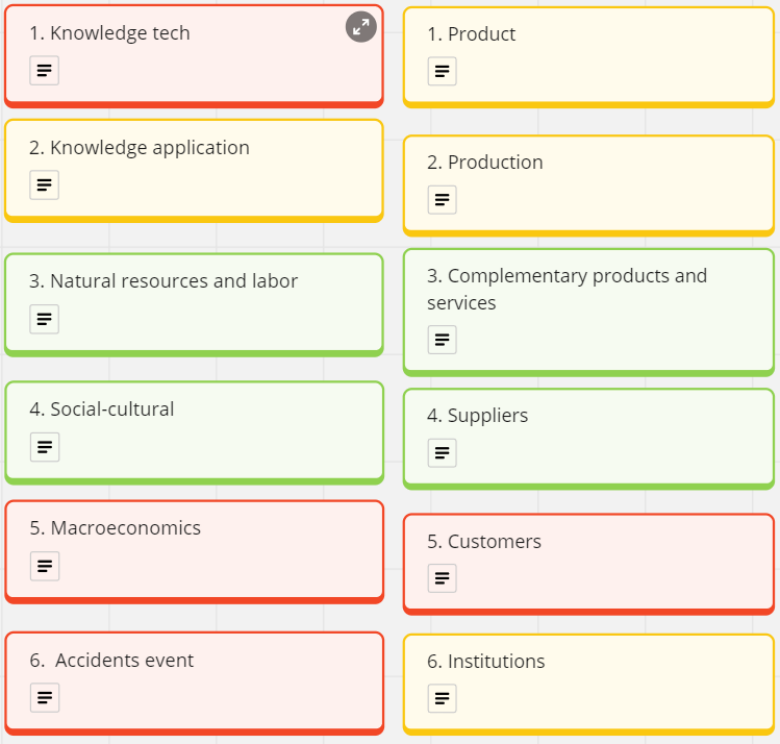

Figure 5.1: TIS factors for kitepower as of 2019 June.

Based on the TIS framework, the barriers have been identified. The causes are also known due to which a choice of niche strategy is made possible. Based on these barriers, it is hypothesised that **Demo and develop niche strategy** has been used. The activities of Kitepower provide evidence for this claim. Kitepower has conducted 50 test flights so far, all for the purpose of testing and development. This claim is further backed by the company, the COO said *" We had to develop and for that, we had to test"* . The only barrier which changes due to this strategy is the **knowledge of technology**. This factor is given priority as for technology-based startups, the lack of a product impacts their legitimacy significantly. Hence it is in the best interest of the company to develop the product to a readiness level where it can be sold to consumers. Based on the actions taken, the components of the business model that change are:

1. Value Proposition: The product undergoes evolution due to development and experimentation. The product value proposition may also be impacted due to the key partners involved. Aruba is a remote island to which the Kitepower product had to be shipped. Hence the value proposition was updated.

2. Value Creation: The addition of new key partners and the creation of new key resources is an effect of experimentation and development.

Note that the VD and VCA do not change. Currently, there are no customers or consumers that derive value from the product. The strategy provides value only to the company in terms of data from testing which leads to the creation of intellectual property.

5.1.2. Kitepower 2019 November

The identified barriers are more or less the same. It was identified that based on the barriers and the actions taken by the company. It can be said that the demo and develop niche strategy was used in collaboration with the Dutch Ministry of Defence with an experimental run conducted in Aruba. An improvement is seen in the **Knowledge of technology**, it has evolved from red to yellow. However, this is only an assumption as the level of knowledge gained is unknown. Other existing barriers are **Product**,**Production**, **Macroeconomics**,**Customers**,**Accident events** and **Institutions**. Compared

to the last data point, knowledge technology is the only barrier that has evolved or changed. Kitepower has yet to reach the sustainable returns growth stage. The barriers to large-scale diffusion identified are seen in Figure 5.2. In a lecture provided by Roland Schmehl, one of the founders of kitepower. He says that *main advantage of kitepower over conventional wind turbines is the cost*. The cost of these kites is supposed to be significantly cheaper than a wind turbine. However, currently that is not true. A kite prototype currently still costs more than a wind turbine. This is also confirmed in an interview with the company. This overall weakens the business case for the company and the product as it fails to deliver on its promise.

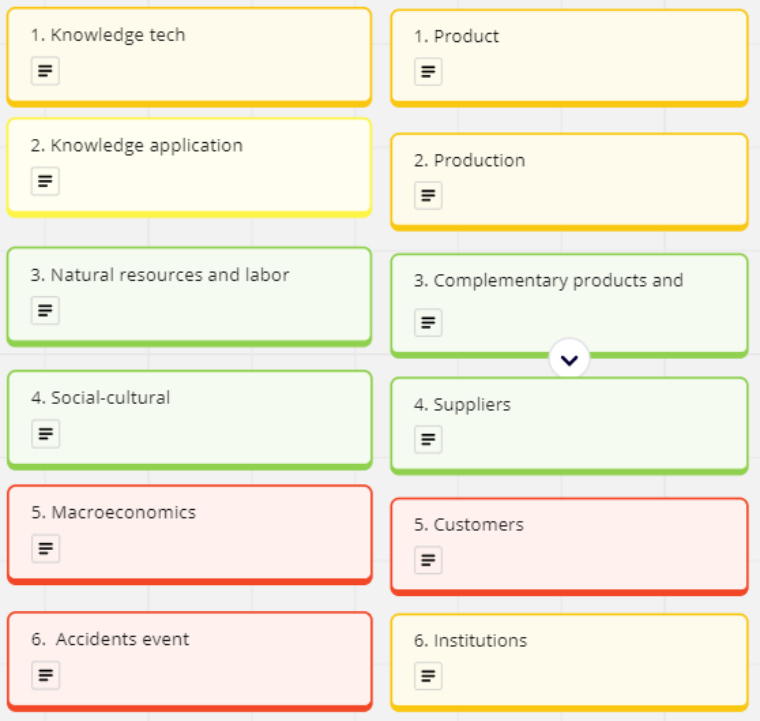

Figure 5.2: TIS factors for Kitepower as of 2019 November.

The supporting evidence from the course reports identifies that the niche strategy used is **the demo and develop niche strategy**. The niche strategies used based on these barriers in 2019 November are the Educate niche strategy and. It can be said that the **educate niche strategy** was employed as Kitepower published research routinely on their website. The only component of the business model that undergoes change is Value creation as their Intellectual property and research are published on their website. *We have research partnerships with TU Delft* said the COO of Kitepower.

1. Value Creation: Research progress is published representing a change in their key resources. Kitepower decided to publish their knowledge thereby aiding in the development of knowledge of technology not just by Kitepower but by any company that may pursue AWE systems. Kitepower is involved with the research headed by the NEON Consortium.

5.1.3. Kitepower 2020 January

The existing barriers for Kitepower still remain the same as in the previous period. However, a report makes use of a customer segment matrix and identifies the markets with the highest score. The customer segments are identified to be Agriculture and Defense with a score of 22. The existing barriers to large-scale diffusion are seen in Figure 5.3. Kitepower later did pilot projects in each of these fields. This would indicate that the projects served as a way of entering a new market and at the same time developing their knowledge of technology. The company also said the same, they believed that by testing their product in various markets, it would garner more interest apart from their personal objectives. This would improve the company's visibility and credibility.

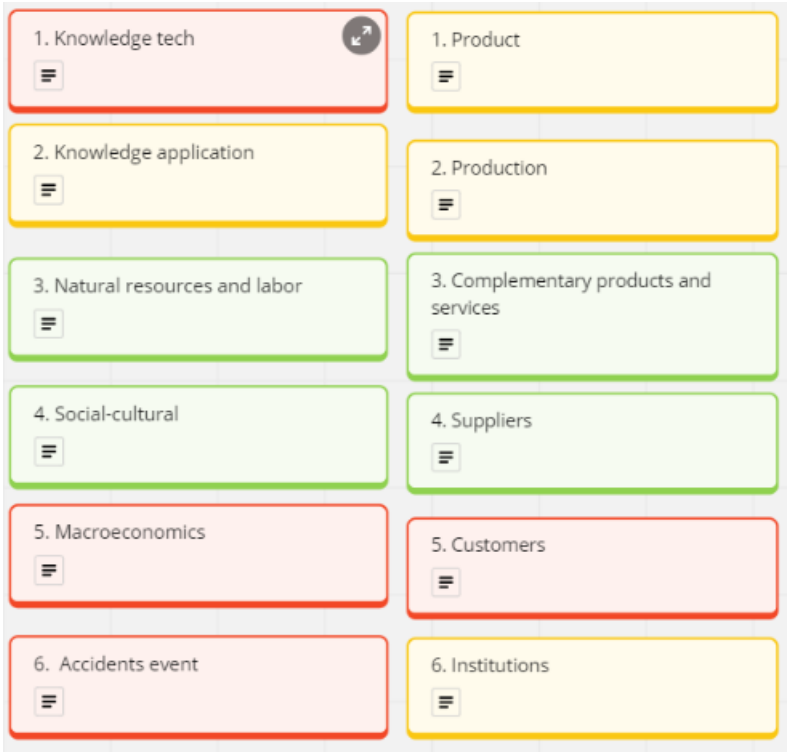

Figure 5.3: TIS factors for Kitepower as of 2020 January

Kitepower is currently using the **redesign niche strategy**and the **educate niche strategy**. Further progress is made on these strategies. The changes made to the business model are :

1. Value Creation: Kitepower moves into a new office along with its workshops.

5.1.4. Kitepower 2021 November

The existing barriers and factors to large-scale diffusion remain unchanged. There is still a priority given to the factor **knowledge of technology**. Based on the given priority for this factor and the actions taken by the company in the period of 2021 November provides evidence that the product underwent a redesign. This can be concluded from the fact that Kitepower launched a new pilot project in the Mullands farmland. However, since a pilot project has been launched, it can be assumed that the **knowledge of technology barrier** has become yellow as there now appears to be a pilot project indicating better knowledge of technology. The identified barriers and factors to diffusion are identified as seen in Figure 5.4. *"We wanted to develop the product for Plug and play applications"* said Johannes, the CEO of kitepower. Due to this focus, the company focused on markets or applications that showcased the plug-and-play capability of Kitepower.

The employed niche strategy is the **redesign niche strategy**. The impacted business model components are:

1. Value proposition: The product VP adapted more towards plug-and-play applications.

Secondary changes have to be made to the VC and VD to accommodate these changes, however since the product was never actually used or applied, the only change would be in the VP.

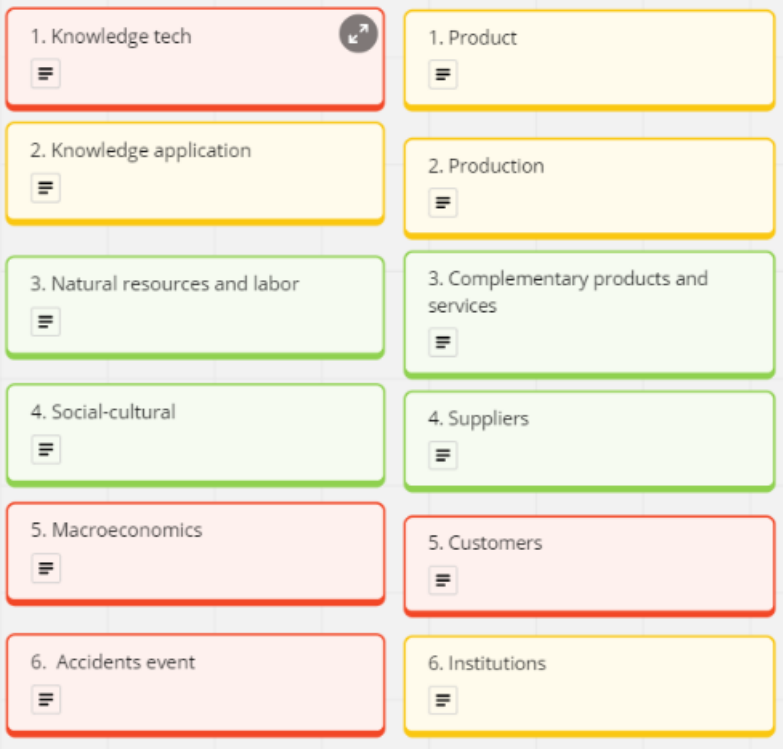

Figure 5.4: TIS factors for Kitepower as of 2021 November.

5.1.5. Kitepower 2022 june

In comparison to the previous data point. **Knowledge of technology** has evolved to yellow instead of red. This development is a result of a new pilot project launched in the agricultural sector The existing barriers to large-scale diffusion are seen in Figure 5.5.

The studies from this time period identify that the niche strategies used so far are demo and develop, redesign and educate niche strategy. The case for the educate niche strategy is made stronger by the research collaboration Further recommendations are made for strategy and the suggested niche strategy is **Explore multiple markets niche strategy**. It can be argued that this niche strategy has been used the company now possesses products with different VPs that cater to different customer segments. An argument can be made that the product underwent hybridization for its application in multiple markets in combination with various green technologies. There is no evidence to support this claim and hence will not be considered. The changes to the business model are:

1. Value Proposition: Added new customer segments to the product catalogue. The product may be marketed differently to each customer segment. This change is a result of the redesign niche strategy. The New VPs aid the company in selling the product with adaptations in multiple markets. Kites can operate across Europe now.

The institution's barrier is considered to have changed based on an article published on their website in May 2022 that states that its product has received permits to operate in any location in Europe due to its classification as a SAIL II product. **Macroeconomics** is considered to be favourable given that, as in 2021 a record high investment in renewable energy was recorded (Furr & Snow, 2015b). As highlighted in the study published by Bloomberg the increased investments made it more favourable for the company. The institutional barrier existed due to the lack of understanding of the technology. *"People's perception was an issue as it was not favourable."* said Roland Schmehl. For this particular issue, Roland performed further research to identify the reason for the poor public image.

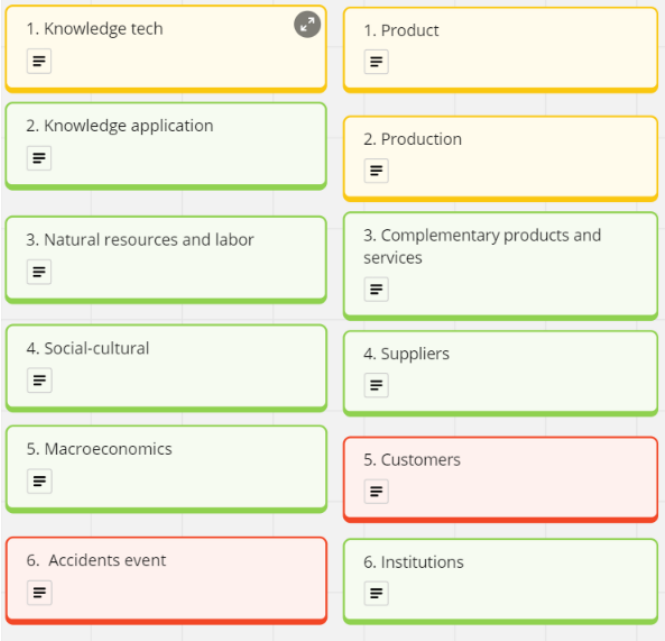

Figure 5.5: TIS factors for kitepower as of June 2022.

5.1.6. Kitepower 2022 November

Kitepower has received funds from new investors and funds from acrowdfundingg campaign meaning that the macroeconomic barrier of no investments is being reduced. The favourable increment in Renewable energy spending meant that companies like kitepower appeared more lucrative to investors. Further recent developments in the geo-political landscape have accelerated the energy transition in the European Sector. This would imply that green technology companies have an advantage in this new market with regard to investments and support from stakeholders. The existing barriers to large-scale diffusion are shown in Figure 5.6.

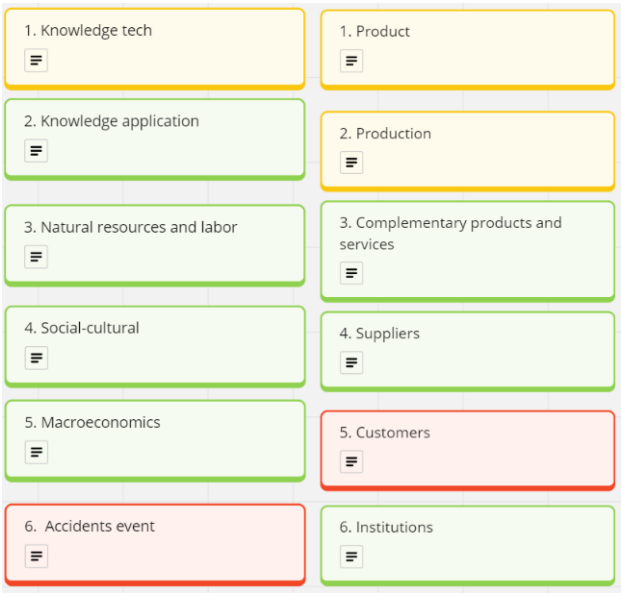

Figure 5.6: TIS factors for kitepower as of November 2022.

The changes to the business model are made in the following components and it is important to remember these changes would made only *If* in the case that the hybridization niche strategy has been applied:

1. Value Proposition: Modify products to ensure seamless collaboration with other green energy technologies, this case was made especially strong with a focus on remote islands.

2. Value Creation: The company has brought on board several new personnel that add new key resources to the company. This change cannot be attributed to a particular niche strategy however and is one that is made by the company as a consequence of expansion. The change is visualised in the canvas.

The recommended niche strategies are demo and develop, educate, and explore multiple markets. The first 2 niche strategies are already in application. The new niche strategy applied is the explore multiple markets. Kitepower has branched into the market of festivals and events, a market which was not targeted before. This required modification of the value proposition. The change however can be classified as minor to intermediate as it was compatible with other clean energy technologies. This may even be considered as the implementation of the hybridization niche strategy both of which commenced around June 2022 as mentioned above.

5.1.7. Kitepower 2023 January

The barriers faced by kitepower to large-scale diffusion as of January 2023 are shown in Figure 5.7.

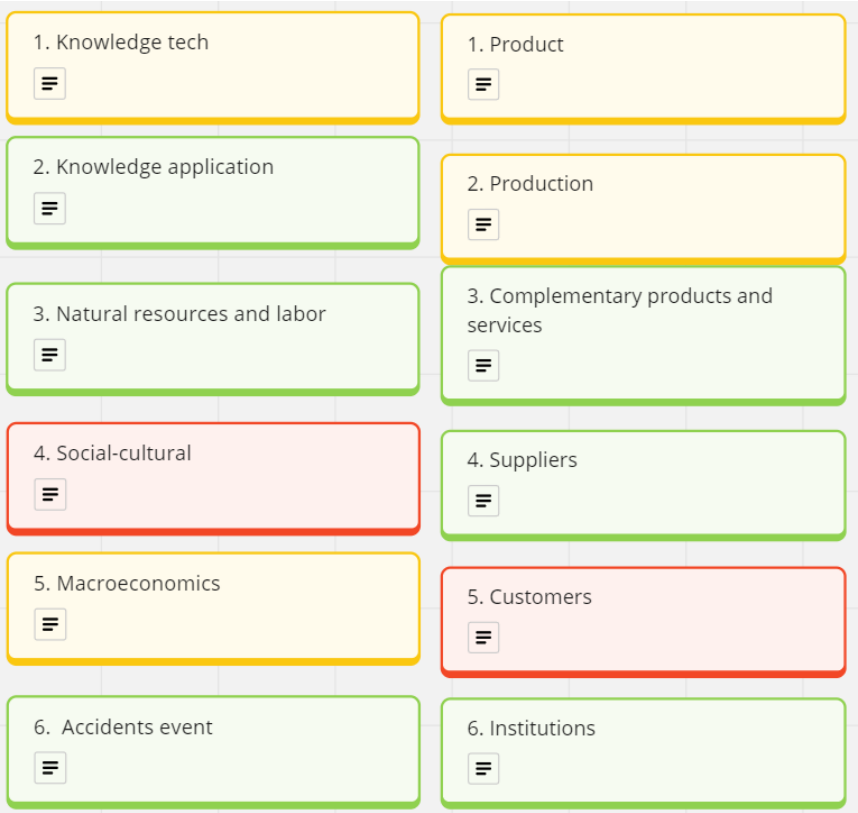

Figure 5.7: TIS factors for Kitepower as of January 2023.

The case studies based on kitepower believe that the niche strategies used are demo and develop, lead user strategy, subsidized niche strategy and explore multiple markets strategy. This report also confirms that the demo and develop niche strategy and explore multiple markets are in fact used. This can be concluded by the fact that various reports came to the same conclusion based on the available information. There is an identified problem in this study. The funding received by Kitepower is through funding programs such as a grant. Kitepower also received funding from InnovationQuarter, an investment company. This further supports the claim that the macroeconomics of the company has improved. At the same time, Kitepower also has received funding from government organizations and the EU which could imply that the subsidized niche strategy is used but there is no evidence that

suggests that changes have been made to the business model. The observed changes in the business model are identified as:

1. Value Creation: Addition of new key resources in terms of added personnel. This change may or may not be related to the niche strategies.

This can be backed up by information from the interview where the COO, Walter Hueber has stated that *"the company had to hire new people as it felt it necessary"*. No other change was confirmed and hence it was assumed that the only change seen was in the value creation.

5.2. Application of the framework to the case of kitepower

In this section, the framework is applied to Kitepower to get a deeper understanding of how the business model dynamics of technology-based startups are impacted as a result of implementing niche strategies. It is also interesting to observe the temporal effects of niche strategies. This is only possible in the case of Kitepower as it is the subject of a longitudinal study.

The changes to the kitepower business model have been explained in the previous chapter. These changes do not however follow the proposed generic pattern. As mentioned it may be possible that in some cases there could be a deviation from the generic pattern. This is one of those cases. Kitepower proves to be a good example in this case, the reason is that the deviation from generic behaviour can be explained. Kitepower is a tech based start-up, however, their technology is not ready to be sold. They do not have a product, the lack of a product or service provided by the company would mean that no revenue is generated. Hence a greater weight was placed on understanding their technology. The VP changes as experiments reveal more information. This can be characterized as a natural product evolution. The VC and VD change due to the implementation of the strategy directly. The VC changes due to collaborations with new key partners, and the creation of key resources by means of intellectual property. The VD changes as a secondary change as there is no value delivered due to the experiment. The company however created new channels and provided information regarding their findings to keep their channels with customers active something which had not been done before. The change to the VP is considered minor. While product evolution is not considered as a change caused by strategy, it is considered as one in this case given that the VP may be impacted by the nature of the experiment. In the case of the Aruba experiment, the VP had to be modified for the product such that it was mobile. The product was packed into a container that followed the plug-and-play principles. This means that the container in itself is the product. It can be transported to the location directly and begin its operations. The chosen niche strategies will continue through 2020. The product value proposition is undergoing updates but has not done so yet. Due to this, there is no change observed in the VP. New resources were acquired as part of the expansion of the company. As of November 2021, the business model does not undergo significant changes. The only change that takes place is the redesign of the agricultural sector. This would mean an update in the VP to suit the new application. It is unclear if the value creation has changed in any way given that Kitepower clearly states that the project is for experimental purposes only. This further strengthens the hypothesis that demo and develop niche strategy as the project is used for routine testing and development. The company stated that the agricultural project was a pilot project that would be run weekly for testing and further development. The product has been co-existing with farm activities and this highlights that the product has practical application in the agricultural sector.

It can therefore be said that Kitepower through the use of the demo and develop niche strategy has improved the barrier to knowledge of technology. The changes in the business model have been mentioned in the previous section.

The VC of Kitepower has changed as there have been new personnel that have been hired to help run the company in January of 2023. This counts as a change in the VC, however, this change cannot be associated with any of the niche strategies, rather as confirmed by the COO, are changes made to account for the expansion of the company.

The overall business model dynamics of Kitepower have been visualised in the appendix. However, it would be difficult to read and hence the dynamics have been split into 2 parts as seen in Figure 5.8 Figure 5.9. The three parts are labelled and visualised below. It is important to note that this is just a hypothesis as most of the information used is from grey literature and in order to validate this model, an interview has to be conducted with Kitepower itself. From the timeline evolution, a lot can be inferred. VCA never changes as the main source of revenue for Kitepower is investor funding and grants,

their cost function is just evolving with no significant changes. The revenue stream of Kitepower is unchanged as there is no revenue generated by the company. In this context, revenue is considered as the money received from the sale of their product.

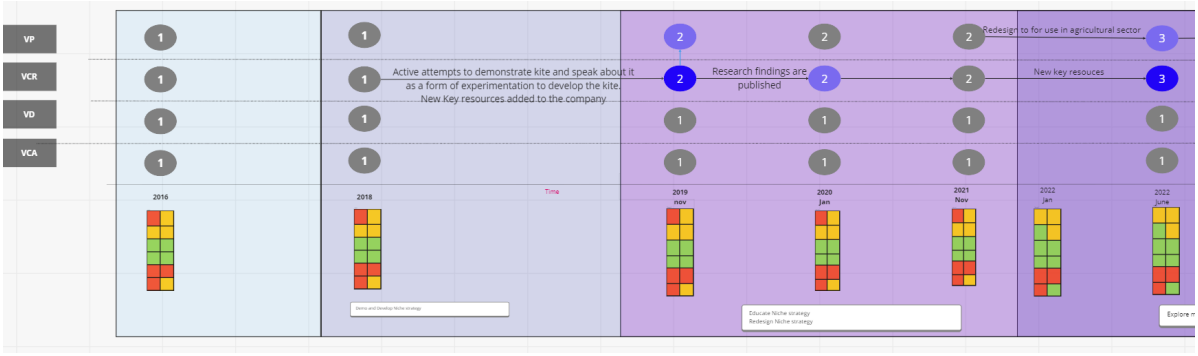

Figure 5.8: Business model dynamics of Kitepower(I)

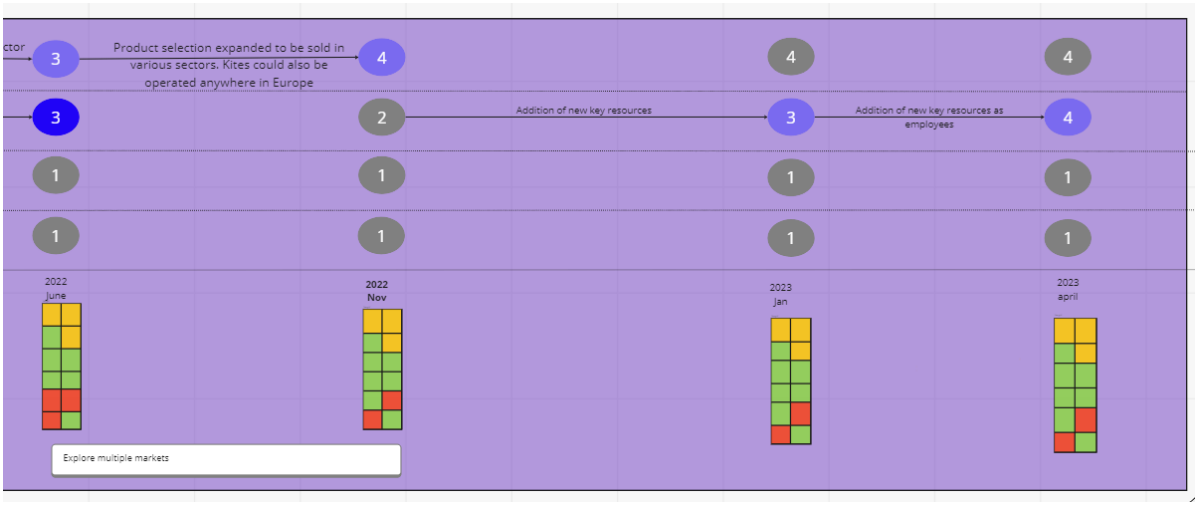

Figure 5.9: Business model dynamics of Kitepower(II)

The changes seen are made in most cases to only the VP, secondary changes in the VCA and VD are not visible due to the lack of the sale of the product. This would mean that the changes to the business model are quite minimal when considering the VCA and VD. The changes have been explained in the relevant section if they have occurred. The relations identified in the case of Kitepower are different from those proposed trends. In fact, the niche strategies in the case of Kitepower do not impact certain components of the business model even though the proposed pattern says that they do. This deviation can be explained. The identified relation states that VD, VC and VCA are supposed to change but in many instances, these components do not experience a change. This can be attributed to the fact that Kitepower does not have a product that is ready for commercial deployment yet. This means that major components of VC and VD may experience change but do not experience said change because they do not exist in the first place. For example, a production line or a supply chain affects the VC, however, in the case of Kitepower, there is no commercial production chain. Hence the VC remains unchanged. In hindsight, this would mean that the choice of Kitepower might not have been the correct one to observe changes in the business model dynamics. This allows the **conclusion** to be made that companies or startups like Kitepower require niche strategies to attain large-scale diffusion. However, when studying their impact, the proposed pattern may or may not be followed given the lack of a product as a direct result of the lack of **knowledge of technology**. The second observation, for technology-based startups a significant weight should be placed on the knowledge of technology as product readiness impacts its performance. Furthermore applications of

niche strategies have shown a positive impact on the barriers but the lack of the product prevents the diffusion and hence knowledge of technology requires higher weight when compared to other barriers. Based on a publication studying business model dynamics. Kitepower can be classified as a company in the R&D phase. It also highlights that in this phase the most important aspect impacting the business model is the technology (de Reuver et al., Apr 2009). This paper further supports the hypothesis that in the TIS factors themselves, weight should be given to knowledge of technology. The research further substantiates the claim that the technological driver is a key part of the business model even in the implementation or rollout phase.

5.3. Evaluating Business model dynamics

The business model dynamics of Kitepower are evaluated by the 4 criteria laid down by (Khodaei & Ortt, 2019). The 4 criteria are :

1. Completeness
   Completeness as specified by the paper refers to all the internal and external factors that may be related to the company that must be accounted for in the business model. The criteria of completeness cover the internal, external and variables that can be changed as a part of the business model. The TIS factors evaluate the competitors, the technology, the products, the regulatory authorities, public acceptance, stakeholders, customers and even the wider market. All the factors are known in the case of Kitepower and hence it can be said with certainty that the business model dynamics of Kitepower are complete in all business model variables.

2. Interrelationships
   This refers to the interrelationships between various elements in the business model. In this case, it can be explicitly stated that there are interrelationships that are accounted for in the business model dynamics. When the value proposition undergoes a change as a result of a strategy, there is a secondary change seen in the value creation to ensure the business model is consistent and the company can function smoothly. The relationship shows up as a secondary change which in the business model can account for any external development. For example, the TU Delft aerospace department making progress in its AWES projects would benefit Kitepower due to the nature of their collaborative relationship. In the case of kitepower, interrelationships between various elements of the business model are known as well the interrelationships with any external party are known as well. In a guest lecture by Dr. Roland Schmehl an advisor of kitepower, He stated that *Kitepower consults with regulatory authorities regarding regulations that may need to be put in place once the technology is operational.* This behaviour allows the conclusion to be drawn that all the interrelationships are specified. Kitepower knows who they work with, they take into account any company, firm or institution working on the field of AWES.

3. Interrelationships over time
   Kitepower has shown strong interrelationships over time. This is the case with its academic partnerships which have grown stronger over the years as a result of increased collaborative partnership. This partnership allows the knowledge of technology to improve over time. Furthermore, components of the business model have been evolving which highlights the dynamic capability of the business model. An example of such is the evolution of the VP. As the knowledge of technology develops, the targeted customer base is also evolving. It initially started as a project, then it went on to the agricultural, festivals and events sector. This highlights that the company has adapted its business model based on the external factors that govern the market. The company has made these changes to optimise its business model to ensure maximum growth. This is consistent with the theory put forward by David Teece about positive feedback loops. In this case, Kitepower innovates in its VP each cycle to make it better. Hence it may be considered that the interrelationships over time are specified. For Kitepower, it would be related to Academic institutions, competing companies, and regulatory authorities. There also exist internal interrelationships such as one that is identified between VP and VC. Whenever the VP undergoes a change, the VC also undergoes a secondary change as the new value offered needs to be created.

4. Framework change
   Framework change refers to the adaptability of the business model in response to a framework

change. Kitepower has shown that it is possible for them to adapt to framework changes. Circularity as a concept has seen a rise and the pursuit of circular technologies is getting stronger. In response, Kitepower modified their product such that the kites were made of a material that once deemed unfit for the kite can be converted into backpacks. This is the response taken by Kitepower to increase its circularity. This allows the conclusion to be drawn that framework changes are assumed but not specified. The business model is capable of evolving but it's unknown how it would take place. Kites use public airspace and kitepower has since voiced concern over regulations for their flight. The impact of a major framework change is assumed to cause changes in the business model. It may not be determined what the changes are, however, Kitepower is confident that it can adapt to any framework change if needed. The framework change criteria are especially important for a radically new tech-based startup as these changes would make or break startups. An example of a possible scenario is that strict regulations regarding airspace would mean that Kitepower cannot operate their product, this would be a drawback for the company.

From the above 4 criteria, it can be concluded that the business model dynamics scores well in completeness as the TIS factors are able to cover all the internal and external variables that affect the business model. For interrelationships, it is seen that the business model will undergo changes to ensure consistency in the business model. Further, the interrelationships over time are identified and specified. The interrelationships over time are assumed but not specified. While interactions with regulatory authorities and competitors do take place, there is no information specific to their interrelationships over time. Finally, the framework change refers to the response of the business model in response to a framework change. There is only one identifiable example which is from the case of Kitepower. The company adopted circularity and was able to quickly make changes to its business model to adapt to this framework change. However, since the framework change experienced is not major, it can be concluded that in terms of framework change, they have been assumed but not specified.

An interview was conducted with the COO of Kitepower. This confirms many of the hypotheses presented regarding kite power with one key difference. The difference is that the strategies were applied with limited potential. All the strategies undertaken by the company were in the interest of developing the product. The long-term goal of diffusion was present. However, in the company's current state, the focus is product development. In a press release by Kitepower, the CEO said "*This investment will significantly boost our ability to refine and develop our system and organisation. Our technology presents an opportunity to disrupt the global renewable energy market through ease of operation and increased capacity. We look forward to a successful collaboration with many learning opportunities."* The statement supports that the technology requires further development. The lack of a product also meant that they did not need to make any noteworthy changes to their value delivery and value capture.

5.3.1. Impact of niche strategies on kitepower

From the above case descriptions provided, it is clear that kitepower has employed some niche strategies. The first niche strategy used is the demo, develop and experiment niche strategy. This is further confirmed from the interview. *"We had the technology or the idea at least but no product. To make it we had to test. We decided demonstrations are the way to go it helps show people that such a product exists and at the same time it helps us accomplish our own technical goals"* - W.Hueber, the COO of Kitepower. Kitepower made some changes to the business model which have been discussed above. Since it was just a demonstration, there was no change in the value delivery and value capture. Kitepower is also partnered with TU Delft and DTU. This points to the educate niche strategy being employed. To further support this claim, Kitepower publishes its research findings routinely that contributes to the development of knowledge of technology. Further niche strategies that have been identified as redesign niche and explore multiple markets. In all of these cases either the value proposition or the value creation changed. There is an identified deviation for each of the strategies. The results are best summarized in Table 5.1

Strategy	Generic	Kitepower	Missing
Demo and Develop	VP,VD,VC,VCA	VP,VC	VD,VCA

Redesign niche	VP,VC,VD,VCA	VP	VC, VD,VCA
Educate niche	VC,VD,VP	VC	VP,VD
Explore multiple markets	VP,VC,VD	VC	VP,VD

Table 5.1: Kitepower changes in relation to the generic pattern

5.4. Kitenergy

Kitenergy is another AWES that will be considered in this research. Kitenergy serves as a good comparative case to Kitepower given that both companies operate in the same sector in the market pursuing the same technology. These are start-up/companies that are very similar. Both companies operate in the European market. Kitepower is based out of Netherlands and Kitenergy is based out of Turin, Italy.

Kitenergy was established in 2010 after winning a research award. From the information available, it was founded after the publication of the paper ”Kitenergy: a radical innovation in wind energy generation” authored by L.Fagiano, M.Milanese and D.Piga. It was founded by a group of 20 professionals. It seems to be lead by professionals which gives the idea that the company is now larger than its original size with new key resources to help grow the company. Kitenergy was based on a research paper and hence it can be concluded that from a commercial perspective the startup lacked the **knowledge of technology**, **Product**. While the product use is clear it can be argued that the **knowledge of application** maybe a minor barrier. The product was based on a new concept and hence it can also be concluded that **institutions** is also a barrier, this conclusion can be supported by (de Reuver et al., Apr 2009) which cites that after a new technological innovation takes places before it can be commercialised an institutional barrier has to be overcome. Other barriers that can be identified are **Production** as it is a young start-up it does not have the production facilities set up. **Complimentary products and services**,**Customers**,**socio-cultural** also further pose a barrier. **Macroeconimcs** also posed as a barrier as investment in the AWES sector at this time was very poor. A major focus was placed on offshore wind farms and moreover the economic crises of 2008 had a major impact on startups in Italy (Lorenti et al., 2019). Investments in high-tech startups saw a rise only after 2012 (Statista, 2022) The initial TIS factors have been visualised in Figure 5.10.

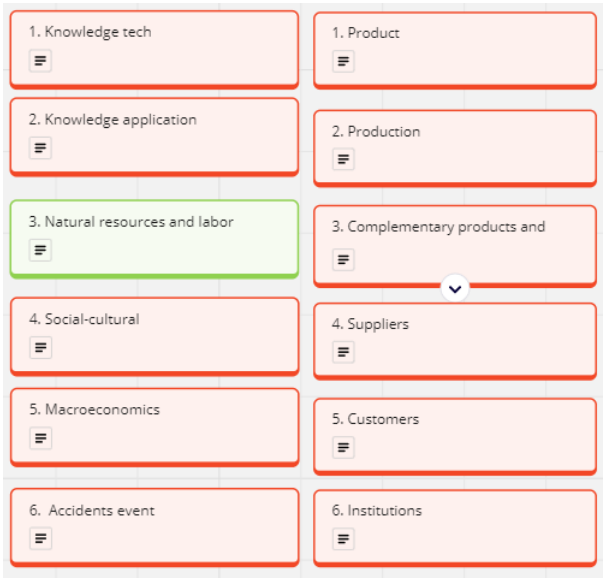

Figure 5.10: The TIS factors for kitenergy(initial).

Based on the actions of the start-up after its foundation it can be said that they used the demo, develop and experiment niche strategy, educate niche strategy and redesign niche strategy. The changes for based on the niche strategies are explained below.

1. Value Proposition: From initial conception, the product has undergone development with more

value being offered to customers in terms of various power outputs. The product underwent minor VP changes as it was later marketed towards remote areas, and islands and later for plug-and-play solutions for emergency aid and disaster.

2. Value Creation: Kitenergy works with various universities and consultancies to develop the technology and product. As of 2022 Kitenergy has 2 products K60 and K100 and is said to be working on their industrial design in collaboration with various parties.

Upon application of these niche strategies and looking at the market the company operates in now, many of the barriers have changed. The information from Kitepower also aids in making suitable assumptions regarding the TIS factors. The company has held 3 successful demonstrations meaning that the **Knowledge of technology** was improved however there is no commercial product yet which means it is only a prototype. Further, the product has been developed for plug-and-play applications and therefore does not require any **complimentary products and services**. From information based on Kitepower and its market, it may be safely assumed that **socio-cultural** and **customers** are still a barrier given that they still do not sell the product. **Institutions** is no longer a barrier as studies have been conducted in to the field of AWES and regulations have been set up.**Knowledge of application** has also been found. The TIS factors for the company have been visualised in Figure 5.11

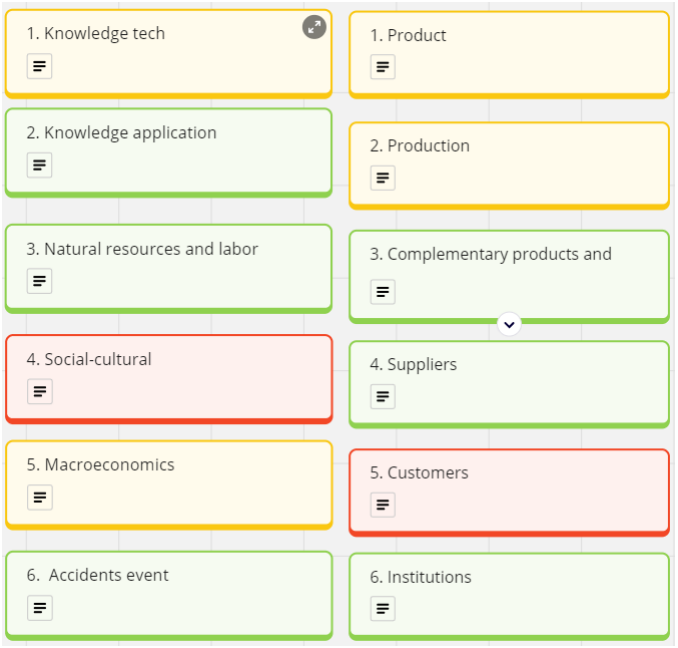

Figure 5.11: The TIS factors for Kitenergy(final).

5.5. Case comparison

Kitepower and Kitenergy are two AWES-based startups that started at different times. Both were a form of academic spin-off. Kitepower was based on students from TU Delft and Kitenergy was founded by professionals after the publication of a paper authored by one of the founders. Both companies are based on the same type of technology and can even be considered competitors. They compete in the same sector and face the same barriers as mentioned in the case description above. However, in the case of kitenergy only the barriers during the initial phase is visualised. To overcome these barriers Kitenergy and Kitepower both employed the use of Demo, develop and experiments niche strategy, Educate niche strategy and redesign niche strategy. It can be concluded from the case that these 3 strategies have been applied in both companies. Both companies show a deviation from the proposed relation. Both companies do not undergo major changes in Value Delivery or value capture. This behaviour can be attributed to the lack of products. Kitepower and Kitenergy while have demonstrated their product successfully still are yet to commercially sell. Their products can only be purchased via their websites on which there is limited information. Two patterns are identified here. The first is that

both companies do not change two components of their business model even after the application of niche strategies. Their deviation is similar and this can be attributed to similar market conditions. The second is that both companies do not change the two components for the same reason, that is the lack of a product. Due to the lack of a product, the companies have never had to deliver value to customers and moreover, the companies could generate revenue as they never had a product to sell.

5.6. Conclusion

Kitepower and Kitenergy are similar companies facing similar barriers and competing in the same market. It can be concluded that both companies exhibit a deviation from the generic pattern. The deviation can be explained with two possible conclusions. The first is that the niche strategy impact is similar on the business models if the companies/ startups compete in the same market and are identical in nature.

The second hypothesis is that the lack of a product in both cases has led to a similar pattern. This pattern if applied would imply that companies that experience the same barriers experience similar behavioural deviations. Both companies lack the **knowledge of technology** and **product**. It is a combination of these two factors that causes this identified deviation. It cannot be concluded with absolute certainty as to which of these hypotheses is more accurate. However, based on (de Reuver et al., Apr 2009) which finds that technological drivers play a role in the business model it may be assumed that the lack of a technological driver, in this case would translate to the lack of product is the most likely explanation for this deviation. This would imply that the generic pattern would not apply to a company that does not have a product. This conclusion is also in line with the inferences of the literature review which identifies that the value delivery and value capture will not change if there is no product to deliver. Such an inference can be made from the definitions of value delivery and value capture.

The third hypothesis is one that is contradictory. It could be that the startups or companies chosen may not be at the stage, at which all components change. This implies that the behaviour deviation shown could be a time-dependent factor. The component did not need to undergo changes just yet but has the option to change under the same niche strategy. This hypothesis would nullify the second hypothesis. Hence, only an attempt is made to understand the behaviour. The industry and time dependence may require further investigation before any relationship can be stated with absolute certainty. This hypothesis is weakened when the company ages are considered, however, if the niche strategies are industry-specific then the deviation may be due to a lack of technical feasibility for the product at the current time. This allows for the components to undergo changes at a later stage when the company or even the market is ready.

6

Conclusion and Discussion

The literature behind business models and niche strategies has been studied to identify possible relations. The major issue identified was the lack of literature exploring this relationship. However further research provided information which allowed the research questions to be answered.

6.1. Conclusion

The conclusion can be described better with the help of employing a question-and-answer format. Here the questions are the research questions framed in the me and their answers serve as a conclusion. There are other conclusions that can be drawn and have been mentioned in the section. The conclusions from the research are described below. The section has been addressed by answering the research questions.

SQ1: How are niche strategies and business models related to each other?

Before the question of how niche strategies and business models are related to each other can be answered, it was first determined if they were related at all. Further research would provide a more clear relation for the same. For this, the upcoming research questions or sub-research questions need to be discussed. Based on literature and the understanding of business models. It can be said that a business model describes how a business is able to function. The next question that can be posed is ”why” a business model is a certain way or what makes it the way it is. This is where the concept of strategy comes in. A strategy is the path taken by the business to achieve its long-term goals. For radically new technology-based startups the long-term goal is large-scale diffusion. The niche strategies are means by which they lay down the path they would be taking to reach this goal. To follow this path, the business has to operate a certain way or instead make changes to the way it operates. These changes that are made are reflected in the business model canvas. Hence the hierarchy is as follows. First, a long-term goal is set. Second, a niche strategy is chosen to help reach this goal and finally, the business model is changed or adapted to implement these strategies.

A literature review has been conducted and past examples of companies that have employed niche strategies have been identified. From the literature, a theoretical expectation of the impact is formulated. The historical cases are considered to check if the impact aligns with the theoretical conclusion. By applying the combination of select historical cases and theoretical background it is identified that there is an impact of some kind.

SQ2: How do changes in niche strategies lead to changes in business models?

As discussed above, it is now evident that changes in the business models are a consequence of the strategy chosen. The strategies set objectives that the business model changes hope to accomplish. Evidence of such can be found in the various cases discovered. In the case of Tesla, they changed from a lead user niche strategy to a subsidized niche strategy. This was a radical shift. Hence changes had

to be made to the business model to keep it consistent towards working with the new strategy. Therefore, repeating the process for multiple companies for each of the niche strategies should theoretically provide a relation between niche strategies and business models. A conclusion of the relations can be drawn from a sample set of companies and an attempt is made to identify the relation. The proposed relationship is highlighted in Table 6.1

Strategy	Impact BM components	Examples
Demo and Develop	VP,VD,VC,VCA	Telegraph
Redesign niche	VP,VC,VD,VCA	WD-40, Post-it notes
Stand-alone niche	VC,VD,VCA	Tesla, GoPro plus
Hybridization or adaptor	VP,VC,VD,VCA	Toyota Prius, Amazon Alexa
Top niche	VP,VC,VD,VCA	Telsa, Fitbit
Educate niche	VC,VD,VP	IBM, Arduino
Lead user niche	VP,VC,VD	Street Scooter, DCT
Explore multiple markets	VP,VC,VD	Segway
Subsidized niche	VCA,VP,VC	Tesla
Geographic niche	VC,VD, VCA	Dynamite

Table 6.1: Identified relation between niche strategies and business model components.

Further, on application of the framework to historical cases to visually trace the business model dynamics another interesting observation is made regarding the barriers and influencing factors. As a result of a nice strategy certain barriers and influencing factors are overcome or circumvented. The proposed strategy barrier relationship is summarized in table Table 6.2.

Strategy	Impacted Barriers
Demo and Develop	7,1,2
Redesign niche	7,8,1
Stand-alone niche	3
Hybridization or adaptor	7,1
Top niche	7,1,2
Educate niche	7,1,5
Lead user niche	7,1
Explore multiple markets	8,5
Subsidized niche	1,5
Geographic niche	4,6

Table 6.2: Proposed relation between niche strategies and Barriers.

The numbers in the impacted barriers column correspond to the number next to the barrier in Table 6.3

7-Knowledge of Technology	1-Product
8-Knowledge of application	2-Production system
9-Natural services and labour	3-Complimentary Products and services.
10-Soico-cultural	4-Suppliers
11-Macroeconomics	5-Customer
12-Accident events	6-Institutions

Table 6.3: TIS factors with numbers

SQ3: How have the niche strategies and business models evolved in the case of AWES-based startups?

Comparing the cases of Kitepower and Kitenergy provides some useful insights. The first is that both companies have not changed their value capture or their value delivery. The deviation is the same and hence it provides enough information to make a reasonable assumption that the behaviour may be a result of the market the company operates. Given that both Kitepower and Kitenergy operate in the same sector and work on the same technology the deviation could be attributed to this similarity. This deviation may not be fully trusted as it is very much possible that the required changes may not have occurred **yet** as the product could be very early in the product diffusion curve. There are other possible explanations for such deviations. The changes due to niche strategy may not have occurred at this stage at which the company is being studied.

6.2. Discussion

While the study has yielded some conclusions which have been discussed above, a few interesting points need to be discussed.

6.2.1. Case study of Kitepower and Kitenergy

In hindsight, while Kitepower and Kitenergy were good cases to study, they proved to be wrong in this research. Their lack of product meant that the application of niche strategies was done differently compared to how it should have been applied. The main difference is the lack of changes in Value Delivery and Value creation. This does not impact the effectiveness of the strategy for the company. However, in this study, the relationship between niche strategies and business model dynamics is being discussed. This deviation provides an incorrect idea of the impact of niche strategies on the business model dynamics of a company. Comparison with kitenergy highlights that even kitenergy a company older than kitepower has not changed its value capture and value delivery yet. This implies that Kitepower and Kitenergy both have products at a similar stage in the product diffusion curve. Both companies have prototypes that they demonstrated but no final product and both companies have tie-ups with universities to help develop the knowledge of technology. It can be concluded that to identify the generic relationship, Kitepower and kitenergy prove to be wrong cases.

6.2.2. Model Application

The model based on the business model dynamics framework can be used by any company. It serves a few purposes. First, it allows the company to see the results of their actions taken. If a strategy is implemented, by highlighting the changes to the business model it may be determined if a niche strategy is effective or not. The framework also serves as a historical record of the company with detailed descriptions of the business model changes caused by each strategy. This allows the company/ startup to adjust their strategy to work best for them. The tool also works as a great visual representation tool for business model dynamics. It is still unclear if it can be said with certainty that understanding the business model dynamics of a company has a positive impact on the future of the company.

6.2.3. Implication of feedback loop

The feedback loop is merely identified in this research and still requires further study before a proper relation may be determined. Understanding the feedback loop allows companies to track how the conditions are responding to the changes they have made or in simple terms it could potentially allow the company to determine its strategy effectiveness. This would provide them with information regarding the changes that are ineffective and those that are effective. This would allow the company to customise the strategy as to what works best for them.

The above holds true if a number of assumptions hold true, such as the market response being immediate or the changes implementations being immediate. Changes require time to happen and are not instances regardless of the business model or market conditions. Identifying if a particular strategy is working or not can prove beneficial to companies and allow for the adoption of these strategies to a version that works better for the company.

6.2.4. Academic relevance

Currently, there are models for the TIS and business model dynamics. There is also research present on the niche strategies, these 3 topics are or can be related. Hence, this study aims are bring the 3 fields

of study together to help build a more complete model by drawing on previous models built in these studies. Bringing these various topics together can bridge the research gap, as discussed previously, the studies follow different approaches and hence putting them together may be beneficial as there now exists a framework that is based on an outside-in approach(TIS) and an inside-out approach (Business model dynamics)

6.2.5. Academic Contribution

The academic contribution of this research is listed below:

1. Identification of relationships: The research identifies and proposes the impact of niche strategies on the business model dynamics. An additional relationship was identified, this relationship relates to the barriers overcome by employing certain niche strategies. Both of these patterns have never been established before and hence this would be a first attempt to do so. Both of these relationships fill an existing research gap.
2. Conceptual Framework: A conceptual framework has been created by using existing frameworks as building blocks. This framework could in better decision-making for a company or startup. This framework takes a step further than the existing business model dynamics framework and the TIS framework.

6.2.6. Managerial or Entrepreneurial application

Startup or company growth can be driven internally or externally. Internally, refers to identifying the existing barriers to large-scale diffusion in the company, the strengths and the weakness of the company. Based on this information, the business model is optimized for maximum benefit. This approach involved the company growing as a result of its choices and strengths. The second approach, the outside-in, provides the consumer point of view of the market. This time, the choice made is based on the external market factors that have been identified by the TIS framework. The barriers and influencing factors identified help in the choice of niche strategies which in turn modify the business model. Since these two approaches have the same end result, it may be beneficial to put these views together to obtain a complete picture and make an informed decision.

6.2.7. Drawbacks or limitations

There is an abundance of literature on the topic of business models, business model dynamics, niches and niche strategies. All of this research however is theoretical. In his research, when considering historical cases, there is no academic literature regarding these companies. Hence associating business model changes as a consequence of the niche strategy becomes difficult and is now entirely based upon gray literature and interviews. This may have a negative impact as the quality of information may be considered sub-par.

The second limitation is that the model is built by using previously built models as building blocks. Hence, caution has to be exercised when applying this framework as it has to take into consideration all the assumptions and drawbacks of the previous models.

The third limitation is that when a strategy is undertaken to overcome a barrier. The response to the implementation of the strategy is shown in the TIS factor as a change in colour. This would mean that the action of the company has caused the barrier to be overcome. There is not enough evidence to prove that the actions of one company can produce an impact that causes a barrier to be broken down. Barriers to large-scale diffusion require the actions of multiple stakeholders and may not necessarily be influenced by the actions of one company.

The fourth limitation is identifying changes in the business models. The changes are identified based on published information and are associated with the respective sections in the business models. These associations are made based on the information and there is unfortunately no way to verify these claims. The reasoning behind how the changes have been identified has been justified as best as possible.

The proposed pattern is built on theoretical knowledge and a select few cases alone. Due to the model being theory and based on a few companies, there might be inaccuracies in the model. Hence

the relation obtained may or may not be held true when applying the relation. To improve accuracy, more companies/ startups could be considered. This would truly create a generic pattern. In this paper, only an attempt is made at creating a generic pattern. The identified pattern is a proposed pattern. The framework can work negatively if a wrong choice of niche strategy is taken. This could be due to the way in which a niche strategy is chosen. Based on (Kamp et al., 2021) a niche strategy can only be chosen appropriately provided that enough information is available. A barrier may exist and it is known. However, to overcome the barrier by choosing a niche strategy, the cause behind the barrier must also be known. The combination of cause and barrier together enables the choice of the appropriate niche strategy. Hence the tool needs to be used appropriately upon obtaining the complete information of both the barrier and its cause. Hence application of the tool alone may not be sufficient.

Tracing the evolution of business models shows the path taken by the company. However, the benefits of doing so may be unknown as of now. The purpose of tracing the business model dynamics, however, acts as a way of showing the response of the market and the company's strategy to each other's ever-changing conditions.

6.2.8. Recommendation for further research

This research combines the business model dynamics framework, niche strategies and the TIS framework. This research is an attempt to tie the loose ends left in related fields of research. By combining these elements, the view of the company obtained is more holistic.

1. Cross-case analysis: The first recommendation would be to perform a cross-case analysis using a much bigger sample size. A bigger sample size would provide more outliers or data points. Hence the proposed or identified relationship between niche strategies and business models would prove to be more generic when a large sample set is considered.

2. Longitudinal studies: The second recommendation is that more longitudinal studies with appropriate cases would enhance the quality of the proposed relation as the temporal effects may be observed more clearly.

3. Quantitative analysis: All the data that has been studied is qualitative, initially, the research made an attempt to perform a quantitative analysis. However, this proved to be a lot more complex than anticipated. This can be explained better using an example. Initially, an attempt was made to convert changes into binary. The changes connected two parameters niche strategies and business model. However, in this case, the change is represented in each of the four components as a 0 (no change) or 1 (change). By doing this, multiple cases can be studied and machine learning algorithms can be used to identify a pattern that accounts for a large number of cases. The large sample set of cases ensures that the outliers are also considered in the pattern.

4. Comparative analysis: Compare the impact of niche strategies on established companies versus startups. Investigate whether niche strategies have different implications for companies at various stages of development.

5. Framework development: Another dimension that may be added to the framework is the determination of the magnitude of change. This feature has been included in the current model however, no attempt has been made to define a scale based on which it may be determined if the business model changes are minor, intermediate or major. The framework could benefit from further refinement in terms of the variables that are taken into account. As research progresses, more variables might have to be incorporated into the model to make it more complete.

6. Industry analysis: The historical cases considered in this research are radically new technologies that have been chosen with no industry consideration. It could be interesting to study the degree to which the impact of niche strategies varies from industry to industry.

A

Appendix

A.1. Interviews

The study on kitepower is longitudinal in nature. Information was obtained from the company directly via interviews. The interview plan as well has been mentioned to highlight the questions asked. The information obtained from the interview is used to support the arguments and validate the changes to the business models.

A.1.1. Interview Plan

The interview will begin with a brief description of the research to provide an idea as to the kind of information being requested. The questions are divided into sections for ease of organizing.

Background Questions

1. What is your role in the company?
2. What was the foundation for Kitepower?
3. What is your opinion on AWES technologies in the current market scenario?

Niche strategies

1. Has kitepower employed any niche strategies?
2. What are the factors kitepower considers while employing a niche strategy?
3. How do you decide which components of the business model need to be changed in response to a strategy?

Value Proposition

1. What is the value proposition of kitepower?
2. Has the value proposition undergone any updates?
3. What determines the changes to the value proposition?
4. Is the value proposition adapted based on the market or is the market chosen based on the updates to the value proposition?

Value Creation

1. What are the components of value creation with kitepower?

2. Did the Value creation change?
3. Was the change a result of a strategic choice?
4. How did the value creation change as a result of a strategic choice?
5. It was observed that professionals have been added to the kite power roster. Would you consider this as an expansion of your value creation as a result of a strategic choice?

Value Delivery and Value Capture

1. What is the current value delivery employed by Kitepower? How does kitepower deliver value to the customers?
2. What are the different components that contribute to value capture for kitepower?
3. Has the value capture for kitepower changed over time?
4. It is observed that the value delivery and value capture of kitepower do not undergo major changes. Is there a reason for such behaviour?

Business model dynamics

1. How does kitepower change its business model to adapt to a strategic change?
2. Does the business model of kitepower take into consideration external factors that impact the business model?
3. What are the external factors that impact kitepower?
4. Is the kitepower business mode rigid? This impression is provided by the lack of change to the value delivery and value capture.
5. What are the interrelationships that currently exist and impact your operations? How do foreign entities(such as research institutes, competitors etc) affect your business model?
6. Are there any regulatory barriers that exist for kitepower?
7. How does kitepower plan to adapt to any framework change that might made in the regulations for AWES products?
8. What do you think is the main barrier that is hindering the large-scale diffusion of Kitepower or AWE systems in general?

A.2. Kitepower Business model dynamics

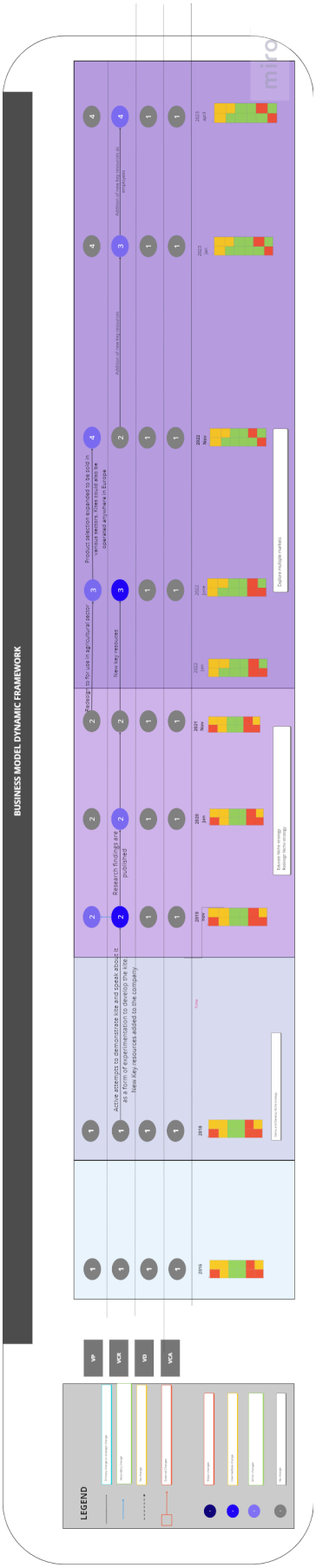

Figure A.1: Business model dynamics of Kitepower over the years.

A.3. Student Survey

The framework was proposed to students and provided to them to be applied to their company cases. The results of the survey are visualised in Table A.1. The purpose of the survey is to determine the applicability of the framework. The questions asked and their meanings are briefly discussed below.

Item description	Mean	SD
Aids in understanding the business model dynamics.	6.244	0.957
Aids in illustrating and communicating the business model dynamics.	6.061	1.234
Aids in better applying the business model dynamics	6.015	1.223
The tool has clear instructions for using its different parts and is easy to navigate.	4.919	1.602
The tool facilitates interaction between team members and develops teamwork.	4.557	1.958
I can easily add, edit text, and choose the layout	5.122	1.707
It is easy to export the final document	4.953	1.770
The design of the application (images, text, graphics, and animation) is appropriate	5.240	1.315
Completeness	5.503	1.421
Interrelationship	5.580	1.364
Interrelationship over time	5.820	1.325
Framework change	5.610	1.322

Table A.1: Survey data summary

The responses have been obtained on the Likert scale of 1 to 7 points. 1 represents disagree and 7 represents agree. The table has been obtained from previous surveys conducted about the business model dynamics framework. The number of students that responded to the questions or the sample size of this experiment is 131 students. The 7-point scale translates as explained in Table A.2.

Score	Implication
1	Strongly disagree
2	Disagree
3	Somewhat disagree
4	Neutral
5	Somewhat agree
6	Agree
7	Strongly agree

Table A.2: Likert Scale

The first 3 questions are related to aiding the user in understanding the business model dynamics and based on the scores given, it was found that the framework had received an average score of 6.061 with a low standard deviation of 1.234 which highlights that the framework is easy to use and majority of students agree with this opinion.
The first 3 questions relate to the application of the framework. The first question enquires if the framework is helpful in understanding the dynamics. The average score received for this question was 6.244 meaning that the majority of the students agree that the framework is helpful in understanding, the low standard deviation also implies that the majority of the students have the same opinion while the number of outliers is very low. The second question is about whether the user can visualise the dynamics of a company using the framework. The survey seems to agree with an average score of 6.061 and a low standard deviation of 1.234, a low standard deviation means that most answers are around the mathematical average. The third question asks if the user is able to use the framework to identify the business model dynamics of the company. The majority of the study agreed with an average score of 6.051. The standard deviation of 1.223 means that there are students who only somewhat agree but again the conclusion that can be drawn is that the majority of the students agree.

The second 3 questions are related to user friendliness and based on the scores given, it was found that the framework had received an average score of 4.919 with a standard deviation of 1.6 which highlights that the framework is easy to use however this opinion is debated.

LEARNING OBJECTIVES AND TEACHING MATERIAL	(n=131, Disagree=1, Agree=7) Item description	Mean	SD
	The business model dynamic framework helps me in better understanding the business model dynamics of the company.	6.244	0.957
	The business model dynamic framework help me better in illustrating and communicating the business model dynamics of the company.	6.061	1.234
	The business model dynamic framework helps me in better applying the business model dynamics of the company.	6.015	1.223
User-Friendliness	(n=131, Disagree=1, Agree=7) Item description		
	The tool has clear instructions for using its different parts and easy to navigate.	4.919	1.602
	The tool facilitates interaction between team members and develop the teamwork.	4.557	1.958
Structure and design	(n=131, Disagree=1, Agree=7) Item description		
	I can easily add, edit text, and choose the layout	5.122	1.707
	It is easy to export the final document	4.953	1.770
	The design of the application (images, text, graphics, and animation) is appropriate	5.240	1.315
The new business model dynamics framework meet the dynamic criteria	(n=131, Disagree=1, Agree=7) Item description		
	Completeness	5.503	1.421
	Interrelationship	5.580	1.364
	Interrelationship over time	5.820	1.325
	Framework change	5.610	1.322

Figure A.2: Survey data results for the framework.

The second set of 2 questions is meant to enquire regarding the user-friendliness of the framework. The first question enquires regarding the ease of navigation in the tool. The feedback resulted in a mean score of 4.919 which would mean that students somewhat agree that navigation is easy and a standard deviation of 1.6 would mean that a low proportion of people somewhat disagreed with the posed question. The second question enquires regarding the ease of interaction and collaboration between team members while using the tool. The average score of 4.557 indicates that the students agreed however a good number of students also felt that the tool had little to no impact on collaboration. The third 3 questions are related to user-friendliness and based on the scores given, it was found that the framework had received an average score of 5 with a standard deviation of 1.7 which highlights the overall feedback on the design of the framework is positive.

The third block of questions enquires about the structure and design of the tool, the scores have been visualised inTable A.1. The average score is around 5 with a standard deviation being around 1.7 meaning that the feedback on the design is overall positive.
Finally, the framework is evaluated on the 4 criteria for dynamics. The average score of all 4 criteria is around 5.8 meaning there is agreement and a low standard deviation also implies that the majority of the students are in agreement with this opinion.

An open question was put to obtain feedback regarding the critics of the business model dynamics framework that has been proposed. Most feedback received was positive, however, a recurring remark regarding the framework was that it was resource-intensive. It requires up-to-date and accurate information regarding the company's actions and the market. Further, some have argued that it may be difficult to implement given the resource intensity of the task.

The framework has been provided to use and the survey has been conducted for one purpose, to understand how it is being applied and if there are any inconsistencies or difficulties in using the framework. The overall results seem positive, in fact, some students go on to identify the feedback loop explained identified in this research.

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